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R. W. WILCOCKS (Hoofredakteur)  
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*Jaargang XII, Reeks A, Afl. 1 (April 1934)*

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P. A. VAN DER BYL: Die Suid-Afrikaanse Hydnaceae  
of Stekelswamme.

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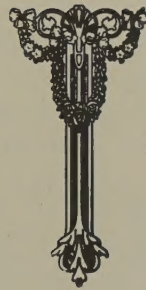
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# Die Suid-Afrikaanse Hydnaceae of Stekelswamme

DEUR

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NASIONALE PERS, BEPERK, Kaapstad, Bloemfontein en Pretoria  
1934





# Die Suid-Afrikaanse Hydnaceae of Stekelswamme.

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Die swamfamilie Hydnaceae is populair bekend as die stekelswamme omdat die hymenium of kiemvlies die oppervlakte van vratte, tande, stekels, of van kamme bedek. Hierdie vratte, tande, stekels of kamme ontwikkel aan 'n saamgestelde vrugliggaam, wat opgebou is uit swamdrade.

Die geslagte en soorte van hierdie familie word veral aan verrottende hout in ons bosstreke aangetref. By sommige geslagte (of soorte van 'n geslag) is die vrugliggaam resupinaat of kruipend, en vorm 'n kors of 'n vlies aan die oppervlakte van die hout. Die vratte of tande, ens. ontwikkel dan aan die oppervlakte van hierdie kors of vlies (in werklikheid die ondervlakte van die vrugliggaam). By ander soorte is die vrugliggaam hoedvormend en ontwikkel 'n duidelike hoed of pileus wat van die substraat uitstaan en tande aan die ondervlakte dra. By nog ander soorte is die vrugliggaam resupinaat maar met teruggeslaande rande wat van die substraat uitstaan — hul is dus resupinaat-hoedvormend. By sommige soorte van die geslag *Hydnum* is die vrugliggaam gesteeld, b.v. *Hydnum coralloides*.

In hierdie mededeling behou ek in die familie Hydnaceae dié geslagte wat daarin behou is deur Killermann in „Die Natürlichen Pflanzenfamilien” van Engler en Prantl (1928). Ek is daar egter bewus van dat sommige van hierdie geslagte miskien beter thuis hoort by die swamfamilie Polyporaceae. Tot dusver is die onderstaande geslagte van die familie Hydnaceae in die Unie van Suid-Afrika aangetref, en ek meld korteliks die hoofkenmerke van elkeen :

**Lopharia**—Vrugliggaam resupinaat. Hymenophoor bestaan uit onderbreekte, kamvormige tande.

Sommige mykologe plaas hierdie geslag by voorkeur in die familie Polyporaceae, en beskou dit as verwant aan die geslag *Merulius* van hierdie familie.

**Irpex**—Vrugliggaam resupinaat, of hoedvormend en sittend. Hymenophoor eers buisvormig (porieagtig), maar later splits die mure van die buisies *in afgeplatte tande of in getande plate*. Die tande is dus tipies aan die voet met mekaar verbind.

Die meer algemene neiging is om hierdie geslag in die familie Polyporaceae te plaas.

**Hydnum**—Vrugliggaam hoedvormend (geen Suid-Afrikaanse soort is resupinaat nie), sittend of gesteeld. Hymenophoor bestaan uit *cylindriese, elsvormige tande, wat nie aan die voet met mekaar verbind is nie*.

**Grammothele**—Vrugliggaam resupinaat. Hymenophoor tandvormig, ietwat porieagtig-netvormig aan die voet van die tande, *dig bedek met klein korreltjies*.

**Grandinia**—Vrugliggaam resupinaat. Hymenophoor bestaan uit halfronde vrattjies, of uit kort en meer cilindriese tandjies, *wat nie gewimperd is nie. Cystidia afwesig*.

**Odontia**—Vrugliggaam resupinaat. Hymenophoor vrattagtig tot duidelik tandvormig. Tande meestal *gewimperd aan die punt. Cystidia aanwesig*.

### **Lopharia.**

*Lopharia mirabilis* (B. & Br.) Pat.

*Illustrasie I.*

Vrugliggame resupinaat, uitgestrek, 2-3 x 4-15 cm., meestal dun en papieragtig, soms meer leeragtig, soms met teruggeslaande hoede wat 5-9 mm. uitstaan; oppervlakte van hoed viltig behaard, liggeel tot geelbruin, soms met kontriese groewe; ondervlakte van hoed en oppervlakte van kruipende gedeelte ligrooi, verbleik tot liggeel, wimperig behaard, met verhewe, onderbreekte, kamvormige tande waaraan die kiemvlies ontwikkel. Spore kleurloos, ellipties, 12-14 x 8-10  $\mu$ . Cystidia aanwesig, 75-160 x 18-24  $\mu$ , uitstaande of min of meer ingebed, oppervlakte grof.

Aan stompe in bosse: Durban, Natal; Suidelike kus van Natal; Knysna.

Aan exemplare van hierdie swam in Suid-Afrika versamel is oorspronklik die naam *Lopharia lirellosa* K. & McOw. gegee. Dit het egter later geblyk dat die Suid-Afrikaanse swam identiek is met *L. mirabilis* wat vroeër van Ceylon beskryf is.

### **Irpex.**

Vrugliggaam heeltemaal resupinaat :

Vrugliggaam wit of geelagtig ... .. 1. *I. obliquus*.

Vrugliggaam umberkleurig ... .. 2. *I. modestus*.

Vrugliggaam resupinaat met afstaande hoeddele :

Vlees geelbruin; oppervlakte van hoed  
viltig behaard ... .. 3. *I. flavus*.

Vlees wit :

Boonste gedeelte van vlees sag en  
sponserig; oppervlakte van hoed  
skerpharig, sponserig ... .. 4. *I. vellereus*.

Vlees nie soos hierbo nie; oppervlakte  
van hoed donsиг behaard ... .. 5. *I. lacteus*.

Vrugliggaam sittend, hoedvormend :

Oppervlakte van hoed kaal, kaneelkleurig  
tot vaalbruin; vlees kaneelkleurig ... .. 6. *I. africanus*.

Oppervlakte van hoed viltig behaard, geel-  
bruin tot vaal; vlees geelbruin ... .. 3. *I. flavus*.

*Irpex obliquus* (Schrad.) Fr.

Vrugliggaam resupinaat, uitgestrek, 5-20 cm., glansend, wit of geelagtig wit, rand meestal vlokkig. Hymenophoor bestaan uit labarintvormige porieë, 2-6 mm. lank, wat later onreëlmatig ingesny of getand is. Vlees witagtig, dun. Spore kleurloos, ellipties, 4-6.5 x 3-3.5  $\mu$ .

Hierdie soort kom aan verrottende hout in Engeland en op die Vasteland voor, en Wood (Rep. Natal Bot. Gndn. 1898) vermeld dit ook van Natal.



2. *Irpex modestus* Berk. (= *Hydnum Ayresii* Berk.) *Illustrasie* 4.

Vrugliggaam resupinaat, uitgestrek, umberkleurig; rand umberkleurig, byssoïed. Subiculum baie dun; swamdrade ongeveer  $4\ \mu$  dik, met gespes. Hymenophoor getand, porieagtig aan die voet; tande 1-2 mm. lank, cilindries of afgeplat, skuins (byna parallel met die substraat).

Aan verrottende hout: Durban, Natal; Pietermaritzburg, Natal.

3. *Irpex flavus* Kl. (= *Polystictus flavus* Jungh.) *Illustrasies* 2 en 3.

Vrugliggaam hoedvormend, of resupinaat en met teruggeslaande hoeddele, of heeltemaal resupinaat (f. *natalensis* Kalch.). Hoede leeragtig, gehalveerd, 2-4 x 2 cm., soms dakpanvormig, oppervlakte viltig behaard, kontries gevoord, geelbruin tot vaal. Vlees geelbruin, ongeveer 1 mm. dik. Hymenophoor getand, of bestaan eers uit labarintvormige porieë (3-5 mm. lank) en later getand. Tande afgeplat, soms ingesny aan die punt. Cystidia aanwesig, liggekleurd of kleurloos.

Aan verrottende hout naby Pretoria, Transvaal (A. O. D. Mogg); aan droë Eucalyptuspale, Tzaneen, Transvaal; aan verrottende hout Piet-Potgietersrust, Transvaal (J. F. W. Grosskopf en I. de V. Malherbe); Umtali, Rhodesië (F. Eyles 4245).

Hierdie soort is ook bekend van Ceylon en van Australië.

4. *Irpex vellereus* B. & Br. *Illustrasies* 5 en 6.

Vrugliggaam resupinaat met afstaande hoeddele. Hoede gehalveerd, staan 0.5-2 cm. (of meer) uit, soms sydelings met mekaar vergroei, oppervlakte skerpharig, sponsagtig, vuilwit of grys, met kontriese kringe. Vlees 2-5 mm. dik, wit, boonste gedeelte sag en sponserig omdat swamdrade hier lossiger in mekaar gevleg is, onderste gedeelte meer stewig en bros. Hymenophoor bestaan uit labarintvormige porieë, ongeveer 1 mm. lank, en is later getand of ingesny, wit tot crème of bruin. Steriele rand 1-2 mm. breed, ferweelagtig. Cystidia aanwesig,  $4-8\ \mu$  dik. Spore kleurloos.



Aan uitgedroogde *Olea laurifolia*, Schwarzwald, Oostelike Kaapland. Aan ou hout in die bosse om Knysna, Kaapland (J.F.V. Phillips en die skrywer).

Hierdie soort is oorspronklik van Ceylon beskryf. Dit is skynbaar na verwant aan *Irpex fuscoviolaceus* (Schr.) Fr., 'n soort wat in die buiteland (Engeland, Amerika en die Vasteland) op die hout van Coniferae aangetref word.

5. *Irpex lacteus* Fr.

Illustrasie 7.

Vrugliggaam resupinaat, wit, word geelagtig, met teruggeslaande hoede wat 1-5 mm. uitstaan. Hoede leeragtig, soms dakpanvormig, oppervlakte donsig behaard, soms kontries gevord. Hymenophoor wit, word geelagtig; bestaan uit dunwandige porieë, 1-2 mm. lank, en wat ingesny of getand is, Spore kleurloos, 4-6 x 2-3  $\mu$ .

Aan verrottende takkies op die grond, Durban, Natal, Ook bekend van Engeland en van die Vasteland.

6. *Irpex africanus* van der Byl, sp. nov.<sup>1)</sup>

Vrugliggaam sittend, hoedvormend. Hoede leeragtig, stewig as hul droog is, halfwaaivormig, imbricaat, staan 1.5-3 cm. van substraat uit, soveel as 3 cm. breed naby die punt, versmal na onder tot 0.5-1.5 cm.; oppervlakte kaal, kaneelkleurig tot vaalbruin; ietwat glansend, met kontriese kringe, glad of ru. Vles 0.75-2 mm. dik, kaneelkleurig. Hymenophoor buisvormig; buise 0.25-0.75 mm. lank; porieë onreëlmstig, hoekig, 3-4 tot die mm., kaneelkleurig tot vaalbruin, later getand.

Aan verrottende hout. Plek waar gevind nie aangeteken nie.

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<sup>1)</sup> *Irpex africanus* Van der Byl, n. sp. Pileo subflabelliformi, coriaceo, in sicco firmo, imbricato, 1.5-3 cm. long., 0.5-3 cm. lat.; superficiei glabra, cinnamomea v. fulva, levi v. scruposa; contextu cinnamomeo, 0.75-2 mm. cr.; tubulis 0.25-0.75 mm. long., poris irregularibus, angulosis, 3-4 in 1 mm., cinnamomeis v. fulvis, aetate irpiciformibus.

Hab. in ligno emortuo.

**Hydnum.**

Vrugliggaam gesteeld, rykelik vertak,  
 wit ... .. 1. *H. coralloides*.

Vrugliggaam nie gesteeld nie :

Vrugliggaam groot, 12 x 6 cm.;  
 oppervlakte glad, swawelkleurig ... 2. *H. setosum*.

Vrugliggaam kleiner :

Vrugliggaam; stewig oppervlakte ferweelagtig behaard, mieliekleurig, met koncentre groewe; tande soveel as 5 mm. lank ... 3. *H. longospinosum*.

Vrugliggaam dun, buigsaam; oppervlakte kaal, vaal-, rooi- of geelbruin by gedroogde eksplare; tande ongeveer 1 mm. lank, stomp 4. *H. pulcher*.

1. *Hydnum coralloides* (Scop.) Fr.

Vrugliggaam gesteeld, regopstaande, vleesagtig, rykelik vertak, wit, word geelagtig, soms bruin by herbarium eksplare, hele vrugliggaam min of meer bolvormig, 5-7.5 cm. diam. (of groter). Primaire steel 5-10 mm. dik, deel in 'n menigte digstaande takkies wat op hul beurt ook weer deel. Tande wit, word gelerig, aan die onderkant van die takkies, hangend, gebundeld, elsvormig, gaaf, 2-6 mm. lank. Spore kleurloos, 3-4  $\mu$ .

Aan verrottende hout : Knysna.

Hierdie soort kom ook in ander lande voor, b.v. Europa, Duitsland, Engeland. Die Suid-Afrikaanse eksplare is minder vertak as die tipiese *H. coralloides* van die buiteland, en die spore is ook ietwat kleiner.



2. *Hydnum setosum* (Pers) Bres. (= *Hydnum Henningsii* Bres.)  
Illustrasie 8.

Vrugliggaam hoedvormend, gehalveerd 12 cm. breed, staan soveel as 6 cm. uit; soms resupinaat en misvormd; oppervlakte swawelkleurig, later soms bruinerig, dikwels min of meer ongelyk. Vlees ongeveer 3 mm. dik, geelbruin. Tande goed ontwikkel, 2-3 mm. lank (of selfs langer), bruin. Spore ellipties, glad, liggeel tot byna kleurloos,  $3-4 \times 4-6 \mu$ .

Aan verrottende hout: Pretoria, Transvaal; Knysna, Kaapland (A. V. Duthie).

Hierdie soort kom in Engeland en op die Vasteland op appelbome voor.

3. *Hydnum longospinosum* Lloyd. Illustrasies 9 en 10.

Vrugliggaam, sittend, hoedvormend. Hoede gehalveerd, dakpanvormig, stewig as hul droog is,  $3-4 \times 1-2$  cm.; oppervlakte geelkleurig (mieliegeel), ferweelagtig behaard, knobbelagtig, met kontriese groewe. Vlees dieselfde kleur as die oppervlakte, 1 mm. dik. Tande dun, donker vaalbruin, soveel as 5 mm. lank, versmal na die punt.

Aan hout: Bepaalde plek nie aangeteken nie, maar na alle waarskynlikheid Knysna.

Lloyd het die naam van hierdie swam in 1923 gepubliseer, maar sonder 'n beskrywing. 'n Beskrywing is deur my gepubliseer in 1928 (S.A. Jnl. Sc. XXV, p. 185).

4. *Hydnum pulcher*, Lloyd.

Vrugliggaam sittend, hoedvormend. Hoed gehalveerd, vleesleeragtig, dun, buigsaam,  $5 \times 9$  cm., oppervlakte kaal, vaal-, rooi-, of geelbruin by gedroogde eksimplare (na alle waarskynlikheid wit by vars plante). Vlees bleek van kleur, 1-2 mm. dik. Tande ongeveer 1 mm. lank, stomp, vaalbruin tot donker rooibruin by gedroogde eksimplare, skynbaar ietwat jellieagtig van geaardheid; inslag bleek, kiemvlies baie donkerder. Spore glad, gekleur,  $3-4 \times 4-6 \mu$ .

Aan dooie stompe: Durban, Natal (J. B. Leslie).

### Grammothele.

*Grammothele mappa* Berk.

Illustrasie 11.

Vrugliggaam korsvormend, uitgestrek, ongeveer 1 mm. dik, soveel as 15 cm. lank en 3.5 breed, rooskleurig-liggeel. Subiculum dun, wit. Hymenophoor tandvormig, met duidelike barsies, ietwat porieagtig-netvormig van onder, tande dig bedek met korreltjies. Basidia  $9.7-16.8 \times 3.7-5.8 \mu$ .

Aan verrottende hout: *Illex capensis*, Katbergse Hoofbos, Oostelike Kaapland; *Gymnosporia*, Horseshoe, Oostelike Kaapland; Buffelsnek, Knysna.

### Grandinia.

*Grandinia rosea* P. Henn.

Vrugliggaam resupinaat, korsvormend, uitgestrek, rooskleurig; rand fibrilleus-byssoid. Kiemvlies bedek die oppervlakte van halfronde vrattjies of kort en meer cilindriese tandjies. Punt van tande nie gewimperd nie. Cystidia afwesig. Basidia „knotsvormig,  $14-18 \times 3.5-5 \mu$ ” (Henning). Spore halfbolvormig tot eivormig, kleurloos,  $4-5 \times 4 \mu$ .

Aan verrottende tak, Eshowe, Soeloeland.

Hierdie soort is oorspronklik deur Henning beskryf van materiaal gevind by Amani, Tanganyika.

### Odontia.

*Odontia arguta* (Fr.) Quél.

Vrugliggaam resupinaat, uitgestrek, 2-6 cm., fyn behaard, dun, uiteindelik met klein barsies, eers wit, later okergeel. Tande aanvanklik korrelagtig, dan cilindries of elsvormig, dig op mekaar, wit, word okergeel, 1-2 mm. lank, gewimperd aan die punt (wimpers slegs sigbaar met behulp van 'n vergrootglas). Swamdrade dun,  $2-4 \mu$  diam., met gespes. Spore breed-eivormig, sye soms ietwat afgeplat, kleurloos, glad,  $4-6 \times 3.5 \mu$ , inhoud



homogeen of guttulaat. Cystidia ongeveer  $5\ \mu$  dik, spoelvormig, of verbreed aan die punt, met of sonder 'n oliedruppel aan die punt.

Aan verrottende hout: Stickland, Kaapland (J. Acock); op die landgoed Groote Schuur, Kaapland (J. Acock).

*Odontia knysnana* Van der Byl, n. sp<sup>1</sup>).

Vrugliggaam resupinaat, stewig vas aan substraat, dun, wit, word crèmeagtig, vergroei met mekaar,  $1-3 \times 3-10$  mm.; rand byssoïed. Vlees kleurloos,  $120-220\ \mu$  dik; swamdrade  $3-4\ \mu$  dik, dunwandig, met gespes, glad of met kristalle bedek, loop parallel na oppervlakte, vertak, lossereg, dig opeen en onduidelik in subhymeniumlaag. Tande kort, korrelagtig,  $6-8$  tot die mm., gewimperd aan die punt (wimpers slegs sigbaar met behulp van 'n vergrootglas). Spore kleurloos,  $3 \times 5-6\ \mu$ . Cystidia ongeveer  $4\ \mu$  dik.

Aan verrottende hout, Knysna.

Die illustrasies in hierdie mededeling is van foto's goedgegunstiglik geneem deur dr. R. I. Nel, Lektor in Insektekunde aan die Universiteit.

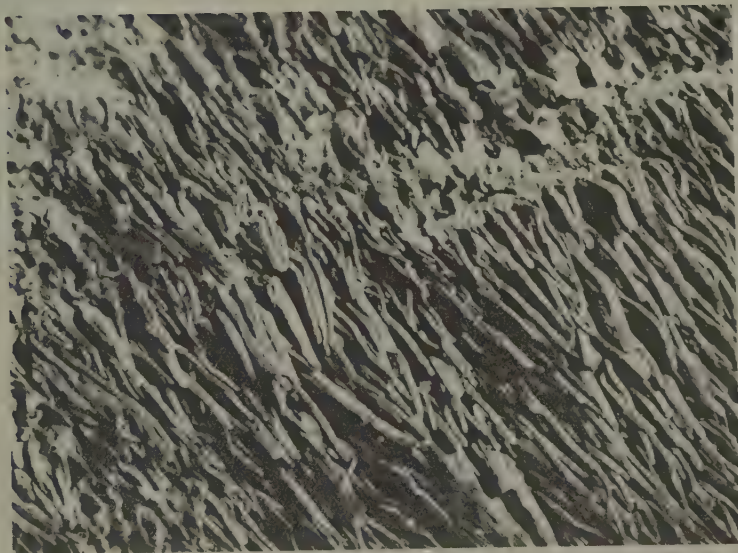
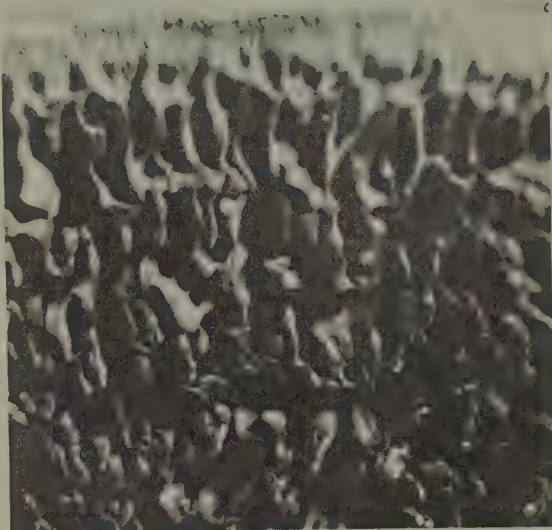
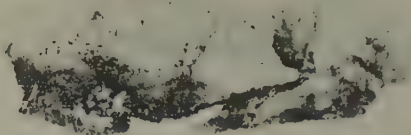
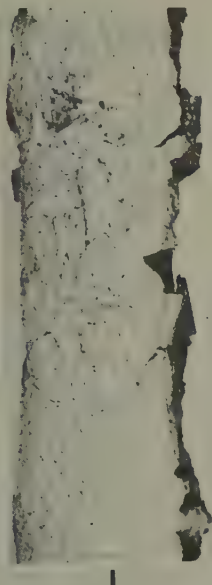
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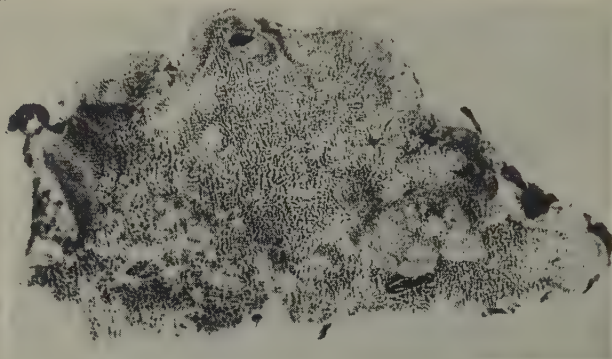
<sup>1</sup>) *Odontia knysnana* Van der Byl, n. sp. *Resupinata, adnata, tenuis, albida, deinde crenea, irregularis, confluens, 1-3 x 3-10 mm., margine byssoideo; contextu 120-220  $\mu$  cr., ex hyphis hyalinis efformato, suberectis, ramosis, 3-4  $\mu$  cr., levibus vel granulis crystallinis asperulis, ad septa nodulosis, laxe dispositis, in strato hymeniali densioribus et indistinctis; verrucis curtis, granuliformibus; sporis hyalinis, 3 x 5-6  $\mu$ ; cystidiis  $\pm 4\ \mu$  cr.*

*Hab. ad. ligna emortua, Knysna, Promont. Bonae Spei.*

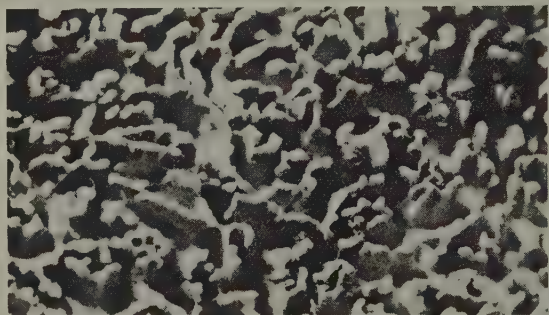




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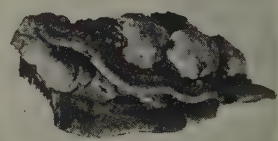
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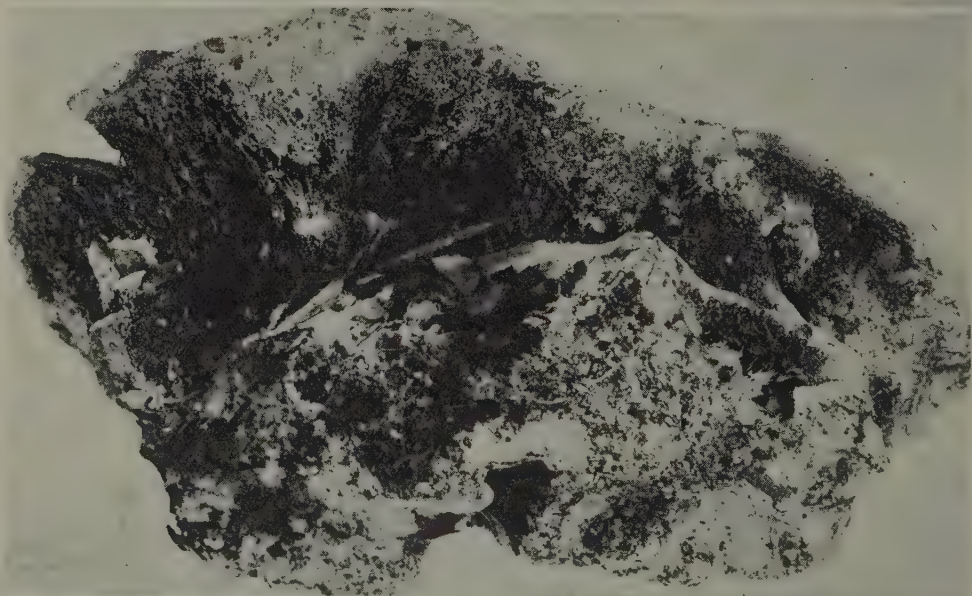
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5. *Irpex vellereus* (Nat. Gr.).

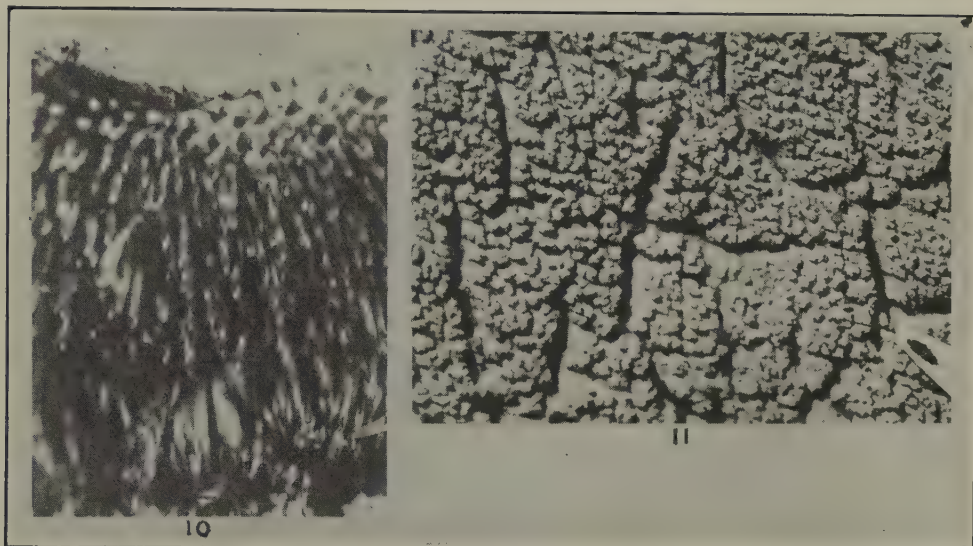
6. *Irpex vellereus* (x7).

7. *Irpex lacteus* (Nat. Gr.).

9. *Hydnum longospinosum* (Nat. Gr.).

8. *Hydnum setosum* (baie min vergroot).





10. *Hydnum Longospinosum* (x7).

11. *Grammothele mappa* (x7).



# A Revision of the Genus *Heleophryne*

BY

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Department of Zoology, University of Cape Town.



NATIONALE PERS, BEPERK, Capetown.

1934





## A Revision of the Genus *Heleophryne*.

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With the doubtful exception of a single unidentified tadpole from the Malabar Zone of Peninsular India, recorded by Annandale and Hora (1922), the genus *Heleophryne* is confined to South Africa. The first species of this genus was discovered in Jonkershoek, Stellenbosch, by Dr. W. F. Purcell and described in the Annals of the South African Museum, Vol. I, part 1, p. 110, in 1898, by Sclater, who named it *Heleophryne purcelli* and referred it to the family Ranidae. In 1905 Roux, presumably without having seen the type, and at that time unique specimen, included *Heleophryne* in that section of the Ranidae with an intercalary bone between the last and penultimate phalanges of the digits (now separated from the Ranidae and called Polypedatidae). There is no mention of this fact in Sclater's original description and it must be admitted that Roux made a guess, which subsequent investigations showed to be wrong. The discovery of *Heleophryne* did not excite much interest until 1909 when Hewitt described a second species, *Heleophryne* regis, and drew attention to the arciferous nature of the shoulder girdle and various other skeletal peculiarities, which, he concluded, stamped it as a Cystignathid. Boulenger, it appears, could not decide definitely upon the systematic position of *Heleophryne*, for in his 'Revised List' (1910) he referred it to the Cystignathidae, whereas in 'Les Batraciens' (1910) he grouped it with the Ranidae, as did also Perrier (1925). Nieden (1923) on the other hand accepted Hewitt's classification. The problem became still more complicated when in 1927 Noble, without giving adequate reasons, stated that: "The most primitive African bufonid is the South African *Heleophryne*" (Noble, 1927, p. 90). Having been referred to three such widely different families as the Ranidae, Cystignathidae and Bufonidae, the systematic position of *Heleophryne* was more uncertain than ever before. Up till that time, however, very little was known about the morphology of this interesting frog and, consequently, in 1930 a series of investigations, under the direction of Prof. C. G. S. de Villiers, were started at Stellenbosch, with a view to acquiring

a more exact knowledge of the morphology of this genus. Before entering upon the systematic part of this paper, it might perhaps not be amiss, especially for the benefit of subsequent workers, to give a synopsis of the results obtained by the Stellenbosch school and the few other workers. The essential points only will be mentioned here and for details the reader is referred to the original papers.

The anatomy of the breast-shoulder apparatus was worked out by Hewitt (1909 and 1925) and Hoffman (1930). Suffice it to say here that the pectoral girdle is typically arciferous (the firmisternous pectoral girdle figured by Hoffman on p. 417 of the South African Journal of Science, Vol. XXVII, 1930, is not the girdle of *Heleophryne regis*, as stated, but of *Hylambates rufus*) and that it possesses a sternum of which the anterior part is ossified in *Heleophryne rosei* (Hewitt, 1925), but not in *Heleophryne purcelli* (Hoffman, 1930). The pectoral girdle is further characterised by the presence of a cartilaginous episternum, which according to Hoffman (1930) appears to be of zonal origin. These two authors also studied the structure of the vertebral column and the results obtained show that *Heleophryne* possesses seven procoelous presacral vertebrae. The transverse processes of the sacral vertebra are, like those of *Rana*, only slightly dilated. The results of the author's investigations on the microscopic structure of the skull are published in the South African Journal of Science of 1930 and 1931. Hoffman is the only investigator who has studied the soft parts of the body and the results of his work are contained in two papers, one on the abdominal viscera and the other on the arterial system.

The object of these investigations was to establish the systematic position of *Heleophryne*. According to Noble (1926) all Ranidae pass through an arciferous and an arcifero-firmisternous stage before acquiring the firmisternous shoulder girdle characteristic of the adults and if Hoffman's statement, that *Heleophryne* shows a tendency to become firmisternous, be correct, then we may, as Hoffman suggests, be justified in looking upon it as a neotenic genus of the Ranidae. On the other hand, if we assume that *Heleophryne* is a purely arciferous form, the mere fact that it possesses an episternum does not exclude its being regarded as a Bufonid, for as Noble (1931) points out, the episternum is



present in a large number of the Bufonidae. The internal anatomy agrees best with the Cystignathid type and the sum total of Hoffman's researches is that *Heleophryne* should be grouped with the Cystignathidae.

It was hoped that the cranial morphology would be a decisive factor in the elucidation of this problem, but this too has not settled the matter. In addition to my own work on the cranial anatomy of *Heleophryne*, *Rana grayi* and the Australian Cystignathid, *Crinia georgiana*, the skull of *Bufo* was studied by Schoonees (1930). The bearing of cranial anatomy on Noble's dictum that *Heleophryne* is merely a toothed Bufonid was discussed in a previous paper (du Toit, C. A., and Schoonees, 1930). If the skull is of any value in determining the affinities of an Anuran, then *Heleophryne* is definitely not a Bufonid. The skull of *Heleophryne*, on the other hand, does not show any striking similarities with that of *Rana*, and less still with that of *Crinia*.

In the present state of our knowledge, therefore, it would be unwise to refer *Heleophryne* to any particular family of the Anura. We need a better knowledge of the anatomy of *Heleophryne* itself, and a much more comprehensive knowledge of the comparative anatomy, not only of the skeleton but of the soft parts as well, of the other Anura. Then, and then only, will we be able to decide which system or which combination of systems should bear most weight in determining the phyletic relationship of this interesting South African Anuran.

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## SYSTEMATIC PART.

In determining the species of a frog, the ratio of the length of the body to that of the hind-limb is undoubtedly important, but the usual procedure in finding this ratio is most unsatisfactory. The point to which the tibio-tarsal joint will reach when the hind-limb is carried forward will depend on the amount of food in the alimentary canal, on the sex, and in the case of a female on the number and size of the ova and various other things. The method employed in this paper is to lay the animal on a flat surface with the hind-limb stretched out at a right angle to the body and then to measure the distance between the vent and the tip of the snout, and the vent and the tibio-tarsal joint.

Unless otherwise stated, the description of the various species is not based on any one or particular specimen but on all the available material.

*Heleophryne purcelli* Sclater.

(Syn. = *Heleophryne rosei* Hoffman nec Hewitt).

(Syn. = *Heleophryne rosei* du Toit nec Hewitt).

(Text-fig. 1a, b and c).



EXPLANATION OF TEXT-FIGURE.

Palmar surfaces of the left hands of (a) *Heleophryne rosei*, (b) *Heleophryne purcelli* and (c) *Heleophryne natalensis*.

*Heleophryne purcelli* Sclater, 1898 (one plate); Roux, 1905; Hewitt, 1909; Boulenger, 1910; Hewitt, 1911; Hewitt, 1913; Nieden, 1923 (one text-fig.); Hewitt, 1925; Hewitt, 1926; Rose, 1926; Rose, 1929 (three text-figs.); du Toit, C. A., 1930; du Toit, C. A., and Schoonees, 1930; Hoffman, 1930 (six text-figs.); du Toit, C. A., 1931 (three text-figs.); Hoffman, 1931; Hoffman, 1931 (four text-figs.).

MATERIAL.

South African Museum :

No. 1313 (type specimen). Jonkershoek, Stellenbosch.

No. 18310 (one adult). Hottentots Holland Mountains, near Somerset West.

No. 18309 (one adult). Franschhoek Pass.

No. 18338 (one adult). Oudebos, Rivier Zonder End Mountains.

Albany Museum :

No. 5056 (a number of tadpoles). Witte River, Worcester district.

A number of tadpoles. Klein Drakenstein Valley.

Dr. W. Rose's private collection :

One adult. Waterfall on Drakenstein Peak, near Lategan Siding.

Zoological collection of the University of Stellenbosch :

One adult. Paradys, Stellenbosch.

Nine adults and a large number of tadpoles. Jonkershoek, Stellenbosch.

Seven adults and a large number of tadpoles. Witte River and tributaries, Bainskloof, Wellington.

Three tadpoles. Boskloof, Hottentots Holland Mountains.

Zoological collection of the University of Cape Town :

A large number of tadpoles in all stages of development. Witte River and tributaries, Bainskloof, Wellington.

Eighteen juveniles and a large number of tadpoles. Boskloof, Hottentots Holland Mountains.

Snout obtuse; nostril round, nearer to the tip of the snout than to the anterior border of the upper eyelid; internarial space subequal to the diameter of the eye; interorbital space broader than the breadth of the upper eyelid; pupil vertical; canthus rostralis distinct; a dermal ridge stretches obliquely downwards from behind the angle of the eye to the fore-limb (this ridge is caused by dermal glands and is probably homologous with the parotid gland of *Bufo*); the tympanum, which is slightly visible in the darkly coloured specimens only, is ventrally situated to this ridge; skull dorsoventrally compressed; maxillary teeth present; vomerine teeth in two transverse rows between the choanae; long diameter of choana slightly more than half the length of a row of vomerine teeth; tongue rounded behind, only partly free; fore-limb about a third the length of the hind-limb; distance from vent to tip of snout slightly more than distance from vent to tibio-tarsal articulation; terminal phalanges of



fingers and toes T-shaped, the arms of the T being shorter in the toes than in the fingers; fingers free, ending in disc-shaped pads which function as suckers; discs on the second, third and fourth fingers about the same size, that on the first one considerably smaller; third finger the longest, second almost as long as fourth, first much shorter; pollex represented only by metacarpal element which remains cartilaginous in the biggest specimens which I have examined (53 mm. from vent to tip of snout); inner metacarpal tubercle distinct, elliptical, its long axis in a line with, or almost in a line with the subarticular tubercle of first finger; outer metacarpal tubercle distinct, elliptical, slightly bigger than inner one; median palmar tubercle small, roundish; subarticular tubercles round and well developed, one on each of the first and second fingers, two on each of the third and fourth ones. The webbing of the toes varies to some extent. The web usually extends up to the bases of the terminal discs, except on the fourth toe in which it reaches up to the middle of the second phalanx and on the first one in which it stops just beyond the metatarsal. The web is slightly incised between the first and second, the second and third and the third and fourth toes. In some specimens the webbing is slightly less, but it always extends at least up to the end of the first phalanx of the fourth toe. The terminal discs of the toes are smaller than those of the fingers. Inner metatarsal tubercle oval and well developed; outer metatarsal tubercle absent; subarticular tubercles oval or suboval, one on each of the first and second toes, two on each of the third and fifth ones and three on the fourth one.

The ventral portion of the body, especially the part between the shoulder girdle and the inguinal region, is covered with small fleshy warts. These warts are also found on the postero-ventral parts of the proximal halves of the thighs, the rest of the legs being quite smooth. The dorsal side of the body is without warts, but minute whitish asperities occur all over the back and sides of the animal. Each asperity appears as a white spot with a corneous granule in the centre. On the back and sides of the body these granules are covered with skin, but in certain regions they become enlarged and appear on the surface as small corneous spines of a brownish colour. The two specimens collected at Bainskloof on 22nd November, 1929, and described by Hoffman as *Heleophryne rosei* (S.Afr. Journ. Sc.,

Vol. XXVII, p. 415, 1930) were wrongly identified. I have examined one of these specimens and am convinced that it is not a *rosei* but a *purcelli*. *Heleophryne rosei* is, by dint of the bony pollex and the shape and arrangement of the palmar tubercles, the best defined species and it has never been found anywhere else but in the streams on Table Mountain. The arrangement of the corneous spines, incorrectly called hooks by Hoffman, has been described as follows: "Ventrally there occurs a conspicuous rectangular patch immediately in front of the shoulder-girdle; then they extend over the ventral and antero-dorsal surfaces of the fore-limbs, but appear on the dorsal side of the fingers only. They appear further in two linear rows all along the lower jaw lateral to the angle of the mouth, and are also irregularly scattered over the snout and over the upper jaw" (Hoffman, 1930, p. 415). The arrangement of these spines, especially those forming the rectangular patch in front of the shoulder girdle, is not always quite as regular as described above. It may also be noted that these spines do not occur in juveniles but only in sexually mature specimens. We do not know exactly when mating takes place, but the fact that these spines are much better developed in some individuals than in others, suggests that they are secondary sexual characters of the same nature as the nuptial pads of other frogs. Moreover in individuals caught on the same day and in the same locality the spines are invariably better developed in the males than in the females. In fact in some females they are altogether absent. I therefore wish to dissociate myself from Hoffman when he says that these structures in *Heleophryne* are not secondary sexual characters. Normally a frog never clasps a rock with its arms and it is difficult to see how the spines on the anterodorsal surfaces of the arms could possibly assist the animal in climbing, as Hoffman maintains.

*Colouration.* The colour varies somewhat. The colour of some of the preserved specimens is purplish with darker, round, faintly white-edged spots of the same colour; hind-limbs cross-banded with darker purple bands. In others the ground colour is chocolate-red with darker or lighter, round, faintly white-edged spots of the same colour; hind-limbs cross-banded with darker brown bands. The ventral surface is white or yellowish white.

*Tadpole.* The body of the tadpole is more or less rectangular in shape with rounded snout and long tapering tail. Eyes dorso-lateral, nearer to the spiracle than to the tip of the snout; nostril much nearer to the eye than to the tip of the snout; internarial space equal to interorbital space; spiracle nearer to the eye than to the anus; spiracle sinistral, opening situated on a tubular backwardly directed process; anus median, close to the anterior limit of the subcaudal crest; tail much deeper than broad, long and graceful, gradually tapering to a pointed end; upper and lower caudal crests equally well developed, the upper one taking its origin at the same level as the anus. The most characteristic feature of the tadpole is the large ventrally situated, circumoral, oval, suctorial disc, the margins of which are bordered with fleshy papillae. The horny jaws (beak) are absent. Labial teeth disposed

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in a single row in each series. Dental formula  $\frac{\quad}{13-16:1+1}$ ,

the outer row of the upper series is weakly developed, the first row of the lower series is narrowly interrupted in the middle, but all the other rows are continuous, four strongly developed rows being followed by ten (in the young tadpoles) or more (in the older ones) weakly developed ones. The colour of the tadpoles varies with that of the stream-bed, from a dull green to amber with small coffee coloured spots all over the body and tail, except on the ventral surface which is somewhat lighter in colour than the rest of the body.

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*Heleophryne rosei* Hewitt.

(Text-fig. 1a).

*Heleophryne rosei* Hewitt, 1925 (two plates); Hewitt, 1926; Rose, 1926 (three text-figs.); Rose, 1929 (eight text-figs.).

MATERIAL.

Albany Museum :

Two adults and ten tadpoles (types). Skeleton Gorge, Table Mountain.



Dr. W. Rose's private collection :

One adult. Skeleton Gorge, Table Mountain.

Zoological collection of the University of Stellenbosch :

Three tadpoles. Skeleton Gorge, Table Mountain.

One tadpole in metamorphosis. Platteklip Gorge, Table Mountain.

Zoological collection of the University of Cape Town :

Three juveniles. Skeleton Gorge, Table Mountain.

Snout rounded; nostril round, nearer to the tip of the snout than to the anterior border of the upper eyelid; internarial space subequal to the diameter of the eye; interorbital space broader than the breadth of the upper eyelid; pupil vertical; canthus rostralis distinct; a dermal ridge stretches obliquely downwards from behind the angle of the eye to the fore-limb; the tympanum which is slightly visible in the darkly coloured specimens only is ventrally situated to this ridge. This ridge is caused by specially developed dermal glands and is probably homologous with the parotid gland of *Bufo* (Hewitt, 1925). It is bigger in the male than in the female. The conspicuous round swelling caused by the powerfully developed temporal muscle behind the eye must not be mistaken for part of the parotid gland. Skull much dorsoventrally compressed; maxillary teeth present; vomerine teeth in two slightly oblique rows between the choanae; long diameter of choana just subequal to the length of a row of vomerine teeth; tongue rounded behind, only partly free; fore-limb about a third the length of the hind-limb; distance from vent to tip of snout slightly more than distance from vent to tibiotarsal articulation; terminal phalanges of fingers and toes T-shaped, the arms of the T being shorter in the toes than in the fingers; fingers free, ending in disc-shaped pads which function as suckers; discs on the second, third and fourth fingers about the same size, that on the first one considerably smaller; third finger the longest, second almost as long as the fourth, first much shorter; pollex represented by a medially directed metacarpal which ossifies quite early in life; inner metacarpal tubercle distinct, elliptical, its long axis not in a line with the subarticular tubercle of first finger; outer metacarpal tubercle distinct, oval; median palmar tubercle small and oval; sub-articular tubercles round and well developed, one on each of the

first and second fingers, two on each of the third and fourth ones. The web between the toes extends up to the bases of the terminal discs, except on the fourth toe in which it reaches up to the middle of the second phalanx and on the first one in which it stops just beyond the metatarsal. In some specimens, especially the younger ones, the webbing is slightly less. The terminal discs of the toes are smaller than those of the fingers; inner metatarsal tubercle oval and well developed; outer metatarsal tubercle absent; sub-articular tubercles round, one on each of the first and second toes, two on each of the third and fifth ones and three on the fourth one.

For the description of the integument I can do no better than to quote Hewitt, 1925, pp. 364-365: "Body of female with dorsal and ventral surfaces quite smooth. Sides of body from the head to the inguinal region with minute isolated asperities scarcely noticeable to the naked eye, each small white spot having a corneous granule in the centre: upper lip with a few such granules near the angle of the mouth: there are also a few on the thigh posterodorsally. In the male these asperities are much more conspicuous. They extend over the middle of the back in its posterior half, and on the sides of the body they take the form of numerous small granular warts: ventrally there is a  $\Lambda$ -shaped patch bearing minute scattered granules immediately in front of the shoulder girdle, and a granulated patch occurs on each side of the body in the inguinal region. A few scattered granules occur also over the thigh and leg. Along the margin of the upper lip a very fine granulation extends throughout: this becomes strongly developed above the angle of the mouth. Fore-limbs of male fairly stout, the humerus with a strong preaxial crest but no other well marked crest."

*Colouration.* Having been in spirit for a fairly long time the colour of the type specimens has faded a good deal and again I quote from Hewitt's original description: "Upper surfaces chocolate red with an indefinite grey reticulation: the grey occurs as numerous small spots on the sides of the body: on the fore part of the head the grey colour predominates. Limbs banded: three or four bands across the leg, three across the tarsus, and bands also occur across the outer toes. Lower surfaces whitish." In the juveniles which I have collected in Skeleton Gorge the ground colour is a purplish brown.

*Tadpole.* Labial teeth disposed in a single row in each series.

Dental formula  $\frac{4}{13-14:1+1}$ ; the outer row of the upper series is weakly developed; the first row of the lower series is narrowly interrupted in the middle, but all the other rows are continuous, four strongly developed ones being followed by ten or eleven weakly developed ones. For the rest the tadpole, as far as I could ascertain, is indistinguishable from that of *Heleophryne purcelli*.

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*Heleophryne regis* Hewitt.

*Heleophryne regis* Hewitt, 1909; Boulenger, 1910; Hewitt, 1911; Hewitt, 1913 (one plate); Nieden, 1923; Hewitt, 1925 and 1926; Rose, 1929; du Toit, C. A., 1930 (eleven text-figs.); du Toit, C. A., and Schoonees, 1930; Hoffman, 1930; du Toit, C. A., 1931; Hoffman, 1931.

MATERIAL.

Albany Museum :

No. 1218 (two adults). Knysna.

Three adults. Knysna.

Two tadpoles. Tradouw Pass. (These tadpoles are indeterminable, but judging by the locality they probably belong to this species).

South African Museum :

No. 14330 (two adults and four juveniles). Knysna.

No. 13949 (two adults). Knysna.

No. 18015 (one adult). Knysna.

No. 18379 (four juveniles). Oudebos, Rivier Zonder End Mountains.

No. 18320 (three adults). Oudebos, Rivier Zonder End Mountains.

No. 18011 (four adults and two juveniles). Rivier Zonder End Mountains.

No. 18311 (one adult). North of railway line on the Eastern side of Hottentots Holland Mountains.

Zoological collection of the University of Stellenbosch :

One adult (S.Afr.Mus.No.14330). Knysna.

One adult (S.Afr.Mus.No.17652). Garcia's Pass, Langeberg Range.

One juvenile and six tadpoles. Rivier Zonder End Mountains.

Three juveniles and a large number of tadpoles. Voëlgat, Hermanus.

Zoological collection of the University of Cape Town :

A number of tadpoles. Voëlgat, Hermanus.

Snout obtuse; nostril round, nearer to the tip of the snout than to the anterior border of the eyelid; internarial space subequal to the diameter of the eye; interorbital space equal to or subequal to the breadth of the upper eye lid; pupil vertical; canthus rostralis distinct; a dermal ridge stretches obliquely downwards from behind the angle of the eye to the fore-limb; the tympanum which is visible in a large number of specimens is ventrally situated to this ridge; skull dorsoventrally compressed; maxillary teeth present; vomerine teeth in two transverse or slightly oblique rows between the choanae; long diameter of choana equal to or subequal to the length of a row of vomerine teeth; tongue rounded behind, only partly free; fore-limb about two-fifths the length of the hind-limb; distance from vent to tip of snout equal to or slightly less than distance from vent to tibio-tarsal articulation; terminal phalanges of fingers and toes T-shaped, the arms of the T being shorter in the toes than in the fingers; fingers free, ending in disc-shaped pads which function as suckers; discs on the second, third and fourth fingers about the same size, that on the first one considerably smaller; third finger the longest, second almost as long as fourth, first much shorter; pollex represented only by a metacarpal element which remains cartilaginous in the biggest specimens which I have examined; inner metacarpal tubercle distinct, elliptical, its long axis in a line with or almost in a line with subarticular tubercle of first finger; outer metacarpal tubercle distinct, elliptical, slightly bigger than inner one; median palmar tubercle small, roundish; subarticular tubercles round and well developed, one on each of the first and second fingers, two on each of the third and fourth ones. The



web between the toes extends up to the bases of the penultimate phalanges, except on the fourth toe in which it only reaches up to the middle or very slightly beyond the middle of the first phalanx. The terminal discs of the toes are smaller than those of the fingers. Inner metatarsal tubercle oval and well developed; outer metatarsal tubercle absent; subarticular tubercles suboval, one on each of the first and second toes, two on each of the third and fifth ones and three on the fourth one.

I have not had occasion to examine fresh specimens of this species, but as far as could be ascertained Hewitt's description of the nature and colour of the integument is correct. The asperities which occur in the two preceding species seem to be less well developed and in the specimens which I have examined they never appear on the surface as corneous spines. Hewitt's description is: "Skin smooth above, granular on the belly and under the thighs. Colour, purplish above with irregular dark spots, the limbs with indistinct dark cross bands; ventral surfaces yellowish white."

*Tadpole.* I have examined all the tadpoles at my disposal but cannot find any real difference between them and those of *Heleophryne purcelli* and *Heleophryne rosei*.

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*Heleophryne natalensis* Hewitt.

(Syn. = *Heleophryne sylvestris* Hewitt).

(Text-fig. 1c).

*Heleophryne natalensis* Hewitt, 1913 (one plate); Annandale and Hora, 1922; Hewitt, 1925; Hewitt, 1926; Rose, 1926; Hoffman, 1930.

*Heleophryne natalensis* described as *Heleophryne sylvestris*: Hewitt, 1926 (one text-fig.); Rose, 1926; Hoffman, 1930.

MATERIAL.

Museum of the Monastery at Mariannhill:

One juvenile, one tadpole in metamorphosis and two other tadpoles. Krantz kloof, Natal.

## Albany Museum :

One tadpole in metamorphosis and two other tadpoles.  
Krantzkloof, Natal.

## Transvaal Museum :

No. 13981 (eleven tadpoles). Woodbush, Northern Transvaal.

No. 11105 (six tadpoles and two tadpoles in metamorphosis).  
Woodbush, Northern Transvaal.

No. 13980 (six tadpoles and three tadpoles in metamorphosis).  
Woodbush, Northern Transvaal.

Nos. 11099-11103 (five tadpoles in metamorphosis). Woodbush Northern Transvaal.

No. 7727 (one tadpole in metamorphosis. Co-type). Woodbush, Northern Transvaal.

## Zoological collection of the University of Stellenbosch :

Seven tadpoles and four tadpoles in metamorphosis. Woodbush, Northern Transvaal.

This species is known from tadpoles and juveniles only and it is no easy task to determine the specific characters of a young *Heleophryne*. The specimens from the Transvaal are classified by Hewitt as *Heleophryne sylvestris* and it is possible that future discoveries will bear out the correctness of his classification. After a careful examination of all the available material, however, I cannot but regard *sylvestris* as identical with *natalensis*.

Snout obtuse; nostril round, nearer to the tip of the snout than to the anterior border of the upper eyelid; internarial space subequal to the diameter of the eye; interorbital space broader than the breadth of the upper eyelid; pupil vertical; canthus rostralis distinct; a dermal ridge stretches obliquely downwards from behind the angle of the eye to the fore-limb; tympanum indistinct; skull dorsoventrally compressed; maxillary teeth present; vomerine teeth in two transverse rows between the choanae; long diameter of choana about half the length of a row of vomerine teeth; tongue rounded behind, only partly free; fore-limb slightly more than half the length of the hind-limb; distance from vent to tip of snout greater than distance from vent to tibio-tarsal articulation (the actual measurements are 30 mm. and 25 mm. respec-

tively); terminal phalanges of fingers and toes T-shaped, the arms of the T being shorter in the toes than in the fingers; fingers free, ending in disc-shaped pads which function as suckers (the terminal phalanges and their pads are relatively smaller than in the other species); discs on the second, third and fourth fingers about the same size, that on the first one considerably smaller; third finger the longest, fourth longer than second and second longer than first; pollex apparently similar to that of *Heleophryne purcelli*; inner metacarpal tubercle distinct, suboval, its long axis in a line with subarticular tubercle of first finger; outer metacarpal tubercle distinct, oval, bigger than inner one; median palmar tubercle small, suboval (omitted in Hewitt's drawing); subarticular tubercles round and well developed, one on each of the first and second fingers, two on each of the third and fourth ones. The web between the toes extends slightly beyond the bases of the penultimate phalanges, except on the fourth toe in which it extends up to the end of the first phalanx. Inner metatarsal tubercle oval and well developed; outer metatarsal tubercle absent; subarticular tubercles round, one on each of the first and second toes, two on each of the third and fifth ones and three on the fourth one.

Belly smooth, but in the juvenile as well as in the tadpoles in metamorphosis an incipient granulation appears on the belly and on the ventral surfaces of the thighs. Dorsal surface smooth, except for a few scattered asperities on the anterodorsal surfaces of the arms.

The colour of the type-specimen is somewhat faded, but I take the liberty to quote from Hewitt's original description: "A light streak occurs between the eyes, bordered behind by a black band; the back has numerous rounded, blackish spots with white centres; upper lip on its anterior half bears whitish spots more or less vertically arranged; two or three white spots are present at the angle of the jaw; limbs have indistinct dark cross-bars; belly is pale in the centre, throat and under surface of limbs are dark."

*Tadpole.* The body of the tadpole is more or less rectangular in shape with rounded snout and long tapering tail. Eyes dorso-lateral, nearer to the spiracle than to the tip of the snout; nostril

much nearer to the eye than to the tip of the snout; internarial space equal to the interorbital space; spiracle nearer to the eye than to the anus; spiracle sinistral, opening situated on a tubular backwardly directed process; anus median, close to the anterior limit of the subcaudal crest; tail much deeper than broad, long and graceful, gradually tapering to a pointed end; upper caudal crest slightly better developed than lower one. The distinguishing feature of the tadpole is the large, ventrally situated, circumoral, oval, suctorial disc the margins of which are bordered with fleshy papillae. Upper half of beak absent; lower half black but not strongly developed; beak V-shaped with apex of V directed downwards. In specimens from the same locality the beak appears to be more V-shaped in some than in others. This is due to the stage of development of the tadpole and to the fixation. Labial teeth disposed in a single row in each series. Dental formula

$$\frac{4}{11-14:1+1}$$
; the two outer rows of the upper series are weakly developed; the first row of the lower series is narrowly interrupted in the middle, but all the other rows are continuous, four strongly developed ones being followed by nine or more weakly developed ones. The inner ends of the first row are slightly curved inwards in some specimens, but this variation is of no specific value for the same condition obtains in tadpoles of *Heleophryne purcelli*. A variation of a similar nature concerns the outer ends of the first row of teeth. In some specimens, which Hewitt regards as a different species and for which he proposed the name of *Heleophryne sylvestris*, the outer ends are straight, whereas in others they are curved forward. This latter feature is considered by Hewitt as a peculiarity of *Heleophryne natalensis*, but in one of the tadpoles from Krantzkloof the outer ends of the first row of teeth are perfectly straight as in the majority of the specimens from the Transvaal. He also states that the teeth are more powerfully developed in the tadpoles from the Transvaal than in those from Natal, but this again is a variation of no specific significance, for one of the Natal tadpoles has teeth which are at least as well developed as those of the Transvaal ones.

Judging by the preserved specimens the natural colour of the tadpoles must be more or less identical with that of the other species.



I take this opportunity of recording *Heleophryne* from Rymer's Creek just outside the town of Barberton, where two tadpoles were found in June, 1933, by Mr. J. H. Power. Both these tadpoles differ from the other recorded species in possessing three upper and nine lower rows of teeth only, but the preservation is so bad that I should not like to make a definite statement. These tadpoles were kindly presented to me by Mr. J. H. Power and at present they are in the zoological collection of the University of Cape Town.

#### KEY TO THE SPECIES.

- 1 (6). Distance from vent to tip of snout not equal to or less than distance from vent to tibio-tarsal articulation; fore-limb about a third or half the length of the hind-limb; interorbital space broader than the breadth of the upper eyelid; web between the toes extending beyond the bases of the penultimate phalanges, except on the fourth toe in which it extends up to the end or beyond the end of the first phalanx ..... 2.
- 2 (5). Distance from vent to tip of snout slightly more than distance from vent to tibio-tarsal articulation; fore-limb about a third the length of the hind-limb; web between the toes extending up to the bases of the terminal phalanges, except on the fourth toe in which it reaches up to the middle of second phalanx and on the first one in which it stops just beyond the metatarsal; second finger not extending beyond the last phalangeal articulation of fourth finger; terminal discs of fingers large; inner metacarpal tubercle elliptical, its long axis almost in line with or not in line with the subarticular tubercle of first finger; outer metacarpal tubercle elliptical or oval..... 3.
- 3 (4). Pollex represented by a small cartilaginous metacarpal; inner metacarpal tubercle elliptical, its long axis in line with or almost in line with subarticular tubercle of first finger; outer metacarpal tubercle elliptical; long diameter of choana slightly more than half the length of a row of vomerine teeth ..... *H. purcelli* Sclater.

- 4 (3). Pollex represented by a medially directed bony metacarpal; inner metacarpal tubercle elliptical, its long axis not in line with subarticular tubercle of first finger; outer metacarpal tubercle oval; long diameter of choana equal or subequal to the length of a row of vomerine teeth.

*H. rosei* Hewitt.

- 5 (2). Distance from vent to tip of snout much more than distance from vent to tibio-tarsal articulation (6:5); fore-limb about half the length of the hind-limb; web between the toes extending slightly beyond the bases of the penultimate phalanges, except on the fourth toe in which it extends up to end of first phalanx; second finger extending beyond the last phalangeal articulation of fourth finger; terminal discs of fingers small; inner metacarpal tubercle suboval, its long axis in line with subarticular tubercle of first finger; outer metacarpal tubercle oval .....

*H. natalensis* Hewitt.

- 6 (1). Distance from vent to tip of snout equal to or less than distance from vent to tibio-tarsal articulation; fore-limb about two-fifths the length of the hind-limb; interorbital space equal or subequal to the breadth of the upper eyelid; web between the toes extending up to the bases of the penultimate phalanges, except on the fourth toe in which it extends up to the middle or slightly beyond the middle of the first phalanx (long diameter of choana equal or subequal to the length of a row of vomerine teeth; terminal discs of fingers large; pollex represented by a small cartilaginous metacarpal; inner metacarpal tubercle elliptical, its long axis in line with or almost in line with subarticular tubercle of first finger; outer metacarpal tubercle elliptical).

*H. regis* Hewitt.

## DISTRIBUTION OF SPECIES.

Owing to the lack of a Zoological Survey in South Africa and the concomitant lack of organised and extensive collecting our knowledge of the distribution of the species is incomplete. The somewhat localised distribution of the various species is undoubtedly due to the peculiar habits of the frog. *Heleophryne* is essentially an inhabitant of cold rapidly flowing mountain streams and low-lying land apparently acts as an insuperable barrier to its dispersal. From the available records the distribution of the species seems to be as follows:—

*Heleophryne rosei* is confined to Table Mountain. It has never been found further south than Skeleton Gorge, but it is possible and even probable that it occurs at least as far south as the Kalk Bay Mountains. Just south of these mountains is a strip of low-lying land which stretches right across the Peninsula from coast to coast, and at the present time at any rate this would act as an insuperable barrier to the dispersal of the species.

Although *Heleophryne purcelli* occurs as far east as Oudebos, Rivier Zonder End Mountains, the main area of its distribution appears to be the western slopes of the Hottentots Holland-cum-Drakenstein-cum-Wleington Range. According to a personal communication from Dr. K. H. Barnard of the South African Museum, *Heleophryne* also occurs in the streams of the Klein Winterhoek Range, and although I have no specimens from that locality, there can be little doubt that the form which occurs there is referable to this species.

*Heleophryne regis* has been recorded from the eastern slopes of the Hottentots Holland Range, from Oudebos, Rivier Zonder End Mountains, from Voëlgat, Hermanus and from Garcia's Pass and Knysna on the Langeberg Range. The tadpoles from Tradouw Pass probably belong to this species and it is not at all unlikely that future discoveries will show that it also occurs beyond Knysna along the Langeberg Range. Dr. K. H. Barnard has observed the presence of a *Heleophryne* at Seven Weeks Poort, Zwartberg Range, but it is impossible to say whether the form which occurs there is identical with *Heleophryne regis*.

The fourth species, *Heleophryne natalensis*, has been recorded with certainty from two localities only, Krantzkloof in Natal and Woodbush in the Transvaal. I have not had the opportunity to examine the specimen from Wakkerstroom and the two tadpoles from Barberton are indeterminable.

The areas of distribution of *Heleophryne purcelli* and *Heleophryne regis* slightly overlap, but for the rest the four species seem to be fairly well separated from one another. Geographically as well as anatomically *Heleophryne rosei* is the best defined species. *Heleophryne* is almost perfectly adapted to mountain brook life and the mountainous regions must have been its habitat for many thousands of years. To-day low-lying country seems to form an insuperable barrier to its dispersal but it must have had a much wider distribution in the remote past. The discontinuity of its present day distribution can be ascribed either to geological changes or to biological factors such as the intrusion of inimical forms. Whichever view one is inclined to favour, the fact remains that *Heleophryne* must be regarded as a relic of the ancient African fauna. The question now arises, where must we look for its centre of origin, for this need not necessarily coincide with its centre of distribution. And this again raises another point, viz. is *Heleophryne* an autochthonous or a heterochthonous member of the African fauna? Zoogeographically, therefore, *Heleophryne* is of great interest, but its real significance will only become clear after its affinities have been established.





EXPLANATION OF PLATE.

(a) Dorsal view of *Heleophryne purcelli*; (b) dorsal view of the tadpole of *Heleophryne purcelli*; (c) ventral view of the tadpole of *Heleophryne purcelli*.



### ACKNOWLEDGMENTS.

My sincere thanks are due to Dr. A. J. Hesse of the South African Museum for valuable suggestions and critical discussion of the text; to Prof. T. A. Stephenson and Prof. C. G. S. de Villiers for the interest taken in the work and to Mr. W. G. H. Coaton, M.Sc., for his invaluable assistance in collecting the specimens. I also wish to acknowledge my indebtedness to the following for the loan of specimens:—The Director of the South African Museum, the Director of the Albany Museum, the Director of the Transvaal Museum, the Director of the Natal Museum, Prof. C. G. S. de Villiers of the University of Stellenbosch, Father P. Boneberg of the Mariannhill Monastery and Dr. Walter Rose. Finally I wish to express my pleasure in being afforded the privilege of contributing to the “Annals” of my *alma mater*.



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Korsmosse van die Unie van Suid-Afrika.  
IV. Die geslag Ramalina.

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NASIONALE PERS, BEPERK, Kaapstad  
1935.





# Korsmosse van die Unie van Suid Afrika:

## IV. Die geslag *Ramalina*.

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Die geslag *Ramalina* behoort tot die familie *Usneaceae* en word van die ander geslagte van hierdie familie onderskei aan die tweecellige ascospore.

### *Kenmerkende Eienskappe.*

Die thallus is heesteragtig, regopstaande of hangend, en bestaan uit afgeplatte of meer cylindriese lobbe. Die lobbe het 'n skorsweefsel aan albei oppervlaktes, en aan die binnekant is die skors meestal versterk deur 'n mechaniese weefsel bestaande uit dikmurige swamdrade, wat of 'n ring vorm of as geïsoleerde bundels voorkom. Die middel van die lobbe is of heeltemal hol of gevul met 'n spinnerakagtige mergweefsel waarin daar holtes voorkom. Die wier behoort tot die geslag *Protococcus* en is geleë aan die buitekant van die mergweefsel. Die apothecia het 'n thallusrand en ontwikkel aan die punte (eindelings) langs die rande, of aan die een sy (sydelings) van die lobbe. In die laaste geval is die lobbe soms knievormend teruggebuig onder die apothecia, wat dus lyk asof hul eindelings ontwikkel het. Asci 8-sporig. Ascospore kleurloos, langwerpig, ellipties of spindelvormig, tweecellig, reguit of gebuig. Pycnidia of swart of bleek.

Groei aan boomstamme en aan klippe.

### *Sleutel tot die Soorte.*

*Groep I.*—Thalluslobbe hol in die middel:

- |                                |                                 |
|--------------------------------|---------------------------------|
| Thalluslobbe cylindries ... .. | 1. <b><i>R. pusilla</i>.</b>    |
| Thalluslobbe afgeplat ... ..   | 2. <b><i>R. geniculata</i>.</b> |

*Groep II.*—Mergweefsel van thalluslobbe spinnerakagtig, vul die middel òf geheel en al òf laat enige holtes :

*Ondergroep A.*—Thalluslobbe cylindries tot hoekig-cylindries :

Thallus Alectoriaagtig ... .. 3. **R. arabum.**

Thallus nie Alectoriaagtig nie :

Met soralia aan die punte  
van kort sytakkes ... 4. **R. intermedia.**

Sonder soralia :

Pycnidia swart :

Ascospore 3—4 $\mu$  breed 5. **R. melanothrix.**

Ascospore 4—10 $\mu$  breed 6. **R. gracilis.**

Pycnidia bleek :

Ascospore reguit ... 7. **R. arbuscula.**

Ascospore gebuig ... 8. **R. angulosa.**

*Ondergroep B.*—Thalluslobbe afgeplat, sorediös of bevrat :

Met prominente, langwerpige soralia  
slegs langs die rande van die lobbe 9. **R. farinacea.**

Met ronde of onreëlmatige soralia aan die punte, verspreid langs die rande, of oor die oppervlakte van die lobbe :

Lobbe netvormig gerimpeld 10. **R. evernioides.**

Lobbe in die lengte gerimpeld  
of geaard ... .. 11. **R. pollinaria.**

Met klein vratties langs die rande of aan beide die oppervlakte van die lobbe :

Mergweefsel kleur nie geel  
met KHO nie ... .. 12. **R. complanata.**

Mergweefsel kleur eers geel met  
KHO en word later rooi ... .. 13. **R. denticulata.**

*Ondergroep C.*—Thalluslobbe afgeplat, nòg sorediös nòg bevrat :

Aan rotse :

Mergweefsel van thalluslobbe kleur nie met KHO nie :

Ascospore 10—13 $\mu$  lank 14. **R. subfraxinea.**

Ascospore 12—19 $\mu$  lank 15. **R. cuspidata.**

Mergweefsel kleur eers geel met

KHO en word later rooibruin 16. **R. scopulorum.**

Aan bome :

Thalluslobbe smal, baie lank

(30—60cm.) ... .. 17. **R. usnea.**

Thalluslobbe baie korter :

Apothecia eidelings of skynbaar eidelings :

Apothecia eidelings 18. **R. fastigiata.**

Punte van lobbe knie-

vormend terugge-

buig onder die

apothecia, wat dus

lyk asof hul einde-

lings ontwikkel 19. **R. calicaris.**

Apothecia sydelings of langs die rande :

Ondervlakte van apothecia gerimpeld :

Ascospore boon-

tjievormig, 5—

7 $\mu$  breed 20. **R. fraxinea.**

Ascospore meer

reguit, 4—5 $\mu$

breed ... .. 24. **R. subfraxinea.**

Ondervlakte van apothecia glad :

Thalluslobbe lan-

cetvormig, in die

lengte geaard 21. **R. yemensis.**

Thalluslobbe lyn-

vormig, sylobbe

meestal min of

meer parallel

met dié waarvan

hul ontstaan, in

die lengte geaard 22. **R. lanceolata.**

## BESKRYWINGS VAN DIE SOORTE.

---

### 1. *Ramalina pusilla* Le Prévost.      Illustrasie 1.

Thallus betreklik kort, ongeveer 7—15 mm. hoog, vorm digte bossies, witagtig, geelagtig of stopverfkleurig; lobbe min vertak, cylindries of ietwat afgeplat, 1—2 mm. diam., eindig in 'n aantal kort puntjies, hol in die middel, soms geperforeerd. Apothecia meestal eidelings, soms sydelings, 1—5 mm. diam., witagtig of liggeel, min of meer plat van bo en gerimpeld van onder. Spore langwerpig-ellipties, reguit of ietwat gebuig,  $9-16 \times 4-7\mu$ .

Aan stam van *Acacia mollissima*, Howick, Natal; boomstam, Zoeloeland (R. P. H. Harris).

Ook bekend van Amerika, Europa, Algiers, Abessinië.

*Hierdie soort is moeilik te onderskei van R. geniculata. By R. pusilla is die thalluslobbe meer cylindries en by R. geniculata meer afgeplat.*

### 2. *Ramalina geniculata* Hook. & Tayl.      Illustrasie 2.

Thallus vorm klein bossies, 1.5—2 cm. hoog, lig-strooikleurig; lobbe afgeplat, ietwat gevurk, eindig in 'n aantal kort puntjies, in die lengte gestreep, hol in die middel, meestal geperforeerd. Apothecia eidelings, plat van bo, glad of gerimpeld van onder, 1—3 mm. diam. Spore langwerpig-ellipties, reguit of ietwat gebuig,  $12-17 \times 4-7\mu$ .

Aan boomstam, Onrust (B. de St. J. van der Riet); aan stam van *Acacia mollissima*, Houtbos, Transvaal; aan stam van *Ocotea bullata*, Knysna.

Oorspronklik beskryf van Nu-Seeland en ook bekend van Amerika, Tasmanië en Ierland.

*Hierdie soort is moeilik te onderskei van R. pusilla. By R. geniculata is die thalluslobbe meer afgeplat en by R. pusilla meer cylindries.*

*f. tenuis* Hue. Thallus liggeel of groenerig. Apothecia meer sydelings as by die soort, 0.5—2 mm. Spore reguit tot ietwat gebuig,  $11-19 \times 4-5\mu$ . Aan *Rhus glauca* naby Stilbaai (dr. J. Muir).



### 3. *Ramalina arabum* Ach.

Thallus stewig, Alectoriaagtig, strooikleurig tot lig-vuilgeel; lobbe cylindries tot ietwat hoekig, 20—25 cm. lank, glad, ietwat onduidelik gestreep, dunner na die punt. Apothecia liggeel tot lig-vleeskleurig of lig-seegroen, 1—2 mm. diam., uiteindelik konvex, ondervlakte glad. Spore ellipties, reguit, 10—16 x 5—8 $\mu$ . Spermatia 3.5 x 1 $\mu$ . Met toediening van KHO kleur die mergweefsel eers geel en word later rooi.

Groei aan boomstamme en aan klippe. Aangeteken van die Kaap die Goeie Hoop, asook van Madagaskar, St. Helena en Nuwe Kaledonia.

### 4. *Ramalina intermedia* (Del.) Nyl.

Thallus 1—2 cm. hoog, rykelik vertak, wit tot geelagtig, glansend; lobbe cylindries tot ietwat afgeplat, geaard in die lengte Korrelagtige soralia ontwikkel aan die punte van kort sytakkes. Apothecia onbekend.

Stizenberger vermeld dat hierdie korsmos aan boomtakke aan die Kaap die Goeie Hoop voorkom. Dit is, sover my bekend, egter nie in later jare hier versamel nie. Dit is ook van Europa en ander wêrelddele aangeteken.

### 5. *Ramalina melanothrix* Laur.

Thallus heesteragtig, kort, ongeveer 2.5 cm. hoog, bleek of lig-strooikleurig, lobbe ongeveer 1 mm. dik van onder, cylindries, hoekig-cylindries, hoekig-gerib of hoekig-afgeplat, punte haarbuisvormig en word swart. Apothecia min of meer eidelings, wit, berypt, 2—3 mm. diam., thallusrand gaaf en dikwels golwend. Spore 12—13 x 3—4 $\mu$ . Pycnidia eidelings, swart, ongeveer 0.25 mm. diam.

Versamel aan die Kaap die Goeie Hoop deur Drège. Sover ek weet, is hierdie soort slegs bekend van die oorspronkelike versameling.

6. **Ramalina gracilis** (Pers) Nyl.      **Illustrasie 3.**

Thallus 2—5 cm. hoog, lig van kleur (gelerig), gevurk; lobbe hoekig-cylindries, meestal 0.5 mm. dik, 'n uitsondering as hul dikker as 1 mm. is; in die lengte gestreep; meestal knievormend gebuig waar die apothecia ontwikkel. Apothecia langs die rande, 1—2 mm. diam., plat van bo, witagtig tot vleeskleurig, sittend of aan kort steeltjies. Spore ellipties of meer eivormig, 12—16 (—20)  $\times$  4—6 (—10) $\mu$ , reguit, of effens gebuig. Pycnidia swart.

Aan *Plectronia*-takke by Brenton, Knysna. Ook bekend van Madagaskar, Brasilië en China.

7. **Ramalina arbuscula** Stzgrbr.

Thallus geel, word swart van onder, vertak; lobbe cylindries tot afgeplat, 2 cm. hoog, soveel as 1 mm. dik, punte elsvormig en word swart, knievormend teruggebuig onder die apothecia wat dus lyk asof hul eindelings is. Apothecia 2 mm. diam., plat van bo, glad van onder; skyf ligrooi, berypt; thallusrand dik, gaaf. Spore 12—15  $\times$  4—6 $\mu$ , reguit. Pycnidia bleek.

Aan klip by Muizenberg, deur MacOwan. Skynbaar slegs bekend van die oorspronklike versameling.

8. **Ramalina angulosa** Laur.

Thallus bleek, aan die voet 0.5—0.9 mm. dik (of dunner); lobbe hoekig-cylindries, in die lengte gerib of gevoord, smaller na die punt. Apothecia lig-seegroen van kleur, uiteindelik konvex, ondervlakte glad of ietwat ongelyk, lobbe knievormend gebuig waar hul ontwikkel, uiteindelik is die apothecia min of meer eindelings. Spore langwerpig, gebuig, 10—16  $\times$  3.5—4.5 $\mu$ . Pycnidia bleek of kleurloos. Mergweefsel kleur nie met KHO nie.

Versamel deur Drège aan die Kaap die Goeie Hoop. *Oppervlakkig lyk hierdie soort op R. gracilis maar sy spore is smaller.* Ook bekend van die berge van die Eiland Borbonia (Bory de Saint Vincent), en van Kalkutta (Kurz).

9. **Ramalina farinacea** (Linn.) Ach.      **Illustrasie 4.**

Thallus heesteragtig, regopstaande of hangend, soveel as 15 cm. lank maar meestal korter; rykelik vertak; lobbe afgeplat tot byna cylindries, smal, 0.5—2 mm. breed, glansend, onreëlmstig kuilig, of met onduidelik strepe of are in die lengte; met smal, uitgerekte en elsvormige punte; met wit, elliptiese soralia langs die rande. KHO—. Apothecia skaars, eidelings of sydelings, klein, skyf groenerig of lig-rooibruin. Spore langwerpig, 8—16 x 4—7 $\mu$ , reguit of gebuig.

Aan boomstamme in Suid-Afrika (Baur en Wilms); Oostelike Provinsie van Kaapland (R. F. Rand).

Ook bekend van Europa, Amerika en Groot-Brittanje.

*Onderskeibaar van R. evernioides en R. pollinaria aan die langwerpige soralia wat slegs langs die rande van die lobbe ontwikkel.*

Var. **squarrosa** Müll. Arg. Thallus klein, in digte groepe; lobbe min of meer cylindries tot vierkantig, baie smal.

In die Transvaal (Wilms). Ook bekend van Queensland, Australië.

10. **Ramalina evernioides** Nyl.

Thallus min of meer regopstaande, gryserig of groenagtig strooikleurig, baie vertak, lobbe afgeplat, onreëlmstig, netvormig gerimpeld en met vlak kuiltjies (nie in die lengte geaard of gerimpeld nie), met klein ronde soralia langs die rande, of verspreid oor die oppervlakte, en dikwels op die riewe van die rimpels. KHO—. Apothecia aan die oppervlakte of langs die rande. Spore langwerpig, effens gebuig, 10—15 x 3—5 $\mu$ .

Aan boomstamme, Lydenburg, Transvaal (Wilms).

Hierdie soort kom ook in die Verenigde State, Europa, Engeland, Ierland en Skotland voor.

11. **Ramalina pollinaria** (Westr.) Ach.

Thallus heesteragtig, min of meer regsopstaande of hangend, baie vertak, lig-strooikleurig of grysgroen; lobbe afgeplat, glansend, soveel as 5 cm. lank, slap, soms taamlik breed, met

rimpels of are in die lengte, kuilig (nie netvormig gerimpeld nie), rande dikwels gekrul of geskeurd. KHO —. Soralia onreëlmstig, wit, fynkorrelagtig. Apothecia eidelings, 2—6 mm. diam. Spore langwerpig, 10—15 — 4—6 $\mu$ , reguit of gebuig.

Stizenberger vermeld dat *f. cariosa* Laur. van hierdie soort aan die Kaap die Goeie Hoop voorkom.

Hierdie soort kom ook in Europa, die Verenigde State, Groot-Brittanje en ander wêrelddele voor.

*R. pollinaria* is onderskeibaar van *R. farinacea* aan sy verspreide soralia, en van *R. evernioides* aan die rimpels in die lengte van die thalluslobbe en nie netvormend nie.

## 12. **Ramalina complanata** (Sw.) Ach.      **Illustrasie 5.**

Thallus heesteragtig, regopstaande, gevurk of onreëlmstig vertak, strooikleurig, 1.5—10 cm. hoog; lobbe afgeplat, smal, ongeveer 1—4 mm. breed, loop tot 'n smal punt uit, oppervlakte gelyk of gevoord, met klein vrattjies langs die rande en soms aan beide die opper- en die ondervlakte, punte soms sorediös maar die orige dele esorediös, mergweefsel kleur nie met KHO nie (by *f. reagens* Wain. kleur die mergweefsel ligrooi en glad nie geel nie). Apothecia langs die rande, sittend of ietwat gesteeld, 0.3—2 mm. diam., eers koppievormig en later skildvormig; skyf bleek tot strooikleurig; ondervlakte glad. Spore langwerpig, reguit of gebuig, 10—16 x 3.5—5 $\mu$ .

Aan boomtakke: Die Hoofde, Knysna; Kaaimansrivier, dist. George; in die Transvaal deur Wilms; aan die Kaap die Goeie Hoop deur Ecklon.

Hierdie soort is ook bekend van Brasilië, Australië, Bermuda en Noord-Amerika.

*Die smal thalluslobbe, waarvan die mergweefsel gladnie geel kleur met KHO nie en met apothecia langs die rande, is eienkappe wat help om hierdie soort van ander te onderskei.*

## 13. **Ramalina denticulata** (Eschw.) Nyl.

Thallus min of meer regopstaand, onreëlmstig vertak, 1.5—7 cm. hoog; lobbe afgeplat, smal, 1—3 mm. breed, punte soms uitgerek, boonste oppervlakte gevoord, met klein vrattjies



langs die rande en min of meer aan beide die opper- en die onder-vlakte, punte uiteindelik ietwat sorediös maar ander dele esorediös, mergweefsel kleur eers geel met KHO en word later rooi. Apothecia naby die punte van die lobbe, klein. Spore langwerpig, reguit of gebuig,  $11-16 \times 3-5\mu$ .

Aan bome: Tafelberg, Kaapstad (MacOwan).

Hierdie soort kom ook voor in Brasilië en in die Verenigde State.

*Dit is onderskeibaar van R. complanata aan die reaksie met KHO.*

#### 14. **Ramalina subfraxinea** Nyl.

Thallus bestaan uit verlengde lobbe, soveel as 10 cm. lank, gevoord, mergweefsel kleur nie met KHO nie. Spore reguit of effens gebuig,  $10-13 \times 4-5\mu$ .

Volgens Stizenberger is dit in Suid-Afrika versamel. Aan klip: Muizenberg (MacOwan); Lydenburg, Transvaal (Wilms).

Kom ook aan boomstamme in verskillende wêrelddele voor: Mauritius, Philippynse Eilande, Falkland-eilande.

*Verskil van R. fraxinea deur smaller spore wat ook meer reguit is.*

#### 15. **Ramalina cuspidata** (Ach.) Nyl.

Thallus heesteragtig, regopstaande, grys- of geelgroen, onreëlmatig vertak; lobbe afgeplat, meestal smal, 2—4 mm. breed, glansend, glad of gevoord en kuilig, punte uitgerek, mergweefsel kleur nie met KHO nie. Apothecia ietwat gesteeld, langs die rande of min of meer eindelings, 2—4 mm. diam., ligrooi of seegroen van kleur. Spore langwerpig-ellipties, reguit of effens gebuig,  $12-19 \times 4-6\mu$ .

Hierdie soort kom in verskillende wêrelddele aan rotse langs die kus voor, en Stizenberger meld dit van die Kaap die Goeie Hoop; op Tafelberg (Eaton).

*Die spore van R. cuspidata is langer as dié van R. subfraxinea.*

16. **Ramalina scopulorum** (Dicks.) Ach.

Hierdie soort word ook in verskillende wêrelddele aan rotse langs die kus aangetref. In algemene eienskappe stem dit ooreen met *R. cuspidata*, maar verskil daarvan deurdat die mergweefsel eers geel kleur met KHO en dan rooibruin word.

var. **cornuata** Ach.

Thallus in digte groepe; lobbe hoekig-cylindries, min vertak, ietwat hol van binne.

Stizenberger meld dat exemplare van hierdie variëteit deur Drège aan die Kaap die Goeie Hoop versamel is.

17. **Ramalina usnea** (Linn.) Howe. [= **R. usneoides**, (Ach.) Fr.]

Thallus hangend van bome, onreëlmatig vertak, 30—60 cm. lank; lobbe afgeplat, smal, bleek van kleur, ongeveer 4 mm. breed, versmal na die punte, geaard in die lengte. Apothecia langs die rande, effens gesteeld, bleek, berypt, 0.5—1.5 (—3) mm. diam. Spore langwerpig-sekelvormig, 15—28 x 3—4.5 $\mu$ .

Hierdie korsmos kom in verskillende tropiese en subtropiese wêrelddele voor: Noord-Amerika, Nu-Seeland, Suid-Afrika.

var. **contorta** (Fw.) Zahlbr.

**Illustrasie 6.**

Thalluslobbe gedraaid, laaste takkies haarbuisvormig. Spore 15—17 x 4 $\mu$ .

By die Gouritzrivier (Breutel); Insiza, Rhodesië, deur dr. E. Nobbs (F. Eyles 2767; Herb. Suid-Afrikaanse Museum 26545).

var. **capensis** (Nyl) Zahlbr.

Aan die Kaap die Goeie Hoop (Drège); Gouritzrivier (Breutel).

18. **Ramalina fastigiata** (Pers.) Ach. **Illustrasie 7.**

Thallus bossievormig, regopstaande, dig, 1—3 cm. hoog, grysgroen van kleur; lobbe afgeplat, glansend, dig opmekaar, gerimpeld of geaard in die lengte, soms hol van binne, ongeveer 1—2 mm. breed, verbreed net onder die apothecia. Apothecia eidelings, 1—4 mm. diam., skyf grysgroen, plat of later konvex; gerimpeld van onder. Spore langwerpig-ellipties, gebuig, 10—17 x 4—7 $\mu$ .

Aan bome; Kentani deur A. Pegler (Herb. Suid-Afrikaanse Museum 46946; Humansdorp deur A. Woodcock (Herb. Suid-Afrikaanse Museum 46931). Ook bekend van Europa en van Groot-Brittanje.

*Hierdie soort is herkenbaar aan die digte thalli, die lobbe waarvan ietwat verbreed aan die punte waar die apothecia ontwikkel.*

19. **Ramalina calicaris** (Hoffm.) Fr. **Illustrasie 8.**

Thallus regopstaande, 0.5—5 cm. hoog, bestaan uit gevurkte, smal lobbe, 0.5—3 mm. breed, afgeplat, grysgroen of lig-seegroen, dikwels in die lengte gevoord, ietwat glansend. Apothecia langs die rande, aan kort steeltjies, dikwels dig opmekaar naby die punt van die lobbe, wat knievormend teruggebuig is onder die apothecia en as gevolg dit laat lyk asof die apothecia eidelings ontwikkel, 1—4 mm. diam., seegroen of vleeskleurig, min of meer plat van bo, gerimpeld van onder. Spore langwerpig-ellipties, reguit, 10—16 x 4—7 $\mu$ .

Aan boomtakke: *Plectronia*-soort, Brenton, Knysna; Umtali, Rhodesië (F. Eyles 1727); die Hoofde, Knysna; in Natal.

Ook bekend van Amerika, Groot-Brittanje, Europa en Asië.

20. **Ramalina fraxinea** (Linn.) Ach.

Thallus heesteragtig, grysgroen, regopstaande of ietwat hangend; lobbe lintvormig afgeplat, smal of breed, versmal meestal na die punt, onreëlmatig vertak, netvormig gerimpeld of geaard. Apothecia langs die rande en ook op die sye, betreklik groot (soveel as 1 cm.) gerimpeld van onder, skyf helder geel-

agtig, rooiagtig vleeskleurig, of groenerig. Spore langwerpig-ellipties,  $10-12 (-16) \times 5-7\mu$ , boontjievormig gebuig.

Aan boomtakke: Volgens Stizenberger is hierdie soort aan die Kaap die Goeie Hoop versamel deur Wawra.

Ook bekend van Europa, Groot-Brittanje, Verenigde State, Nu-Seeland, Kanarie-eilande, Algiers.

21. **Ramalina yemensis** (Ach.) Nyl. **Illustrasie 9.**

Thallus min of meer regopstaande of hangend, onreëlmatig of vingervormig gelob van naby die voet, 5—7 cm. lank; lobbe afgeplat, soms weer gelob, lancetvormig, soms min of meer lynvormig, varieer baie in breedte (by Suid-Afrikaanse exemplare meestal 0.1—1 cm.); in die lengte (veral aan die voet) gerib of geaard, esorediös. Apothecia aan die sye of langs die rande, meestal volop, 0.5—2 mm. diam.; ondervlakte glad. Spore langwerpig-ellipties, reguit of ietwat gebuig,  $9-17 \times 4.5-7\mu$ .

Aan boomtakke in verskillende dele van die Unie: Piketberg; Umtali, Rhodesië; aan akkerbome, Ceres; Klapmuts, dist. Paarl; aan *Acacia mollissima*, Howick, Natal. Hottentots Holland (MacOwan in Herb. S.A.M. 47016); dist. Kentani (Pegler in Herb. S.A.M. 46947 en 46948).

Ook bekend van Brasilië, die Verenigde State en Australië.

f. **fenestralis** Stzbgr.

Thalluslobbe met gate (vensters). Aan boomstamme op Leeukop, Kaapstad (MacOwan).

f. **sublinearis** Nyl. **Illustrasie 10.**

Thalluslobbe baie smal, byna lynvormig, minder as 1 mm. breed.

Aan *Gymnosporia buxifolia*, Eteza, Soeloeland.

var. **Eckloni** (Sprgb.) Wain.

Thallus ongeveer 4—10 cm. lank, vingervormig gelob; lobbe lancetvormig, baie smaller na die punt, apothecia sydelings. Böschberg, Somerset-Oos (MacOwan in Herb. S.A.M. 46979, en 46980); Noordhoek, Kaapse Skiereiland (K. H. Barnard in Herb. S.A.M. 46924).



var. **membranacea** (Laur.) Nyl.

**Illustrasie 11.**

Thalluslobbe ongeveer 1—1.5 mm. breed, baie dun.

Takke van *Plectronia*. by Brenton, Knysna.

var. **tenuissima** (Mey. & Fw.) Zahlbr.

Thalluslobbe ongeveer 1 mm. breed, of smaller, gevoord of byna glad; spore 12—14 x 5—5.5 $\mu$ .

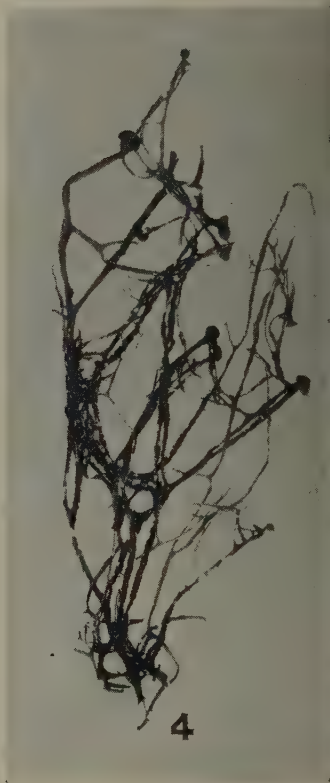
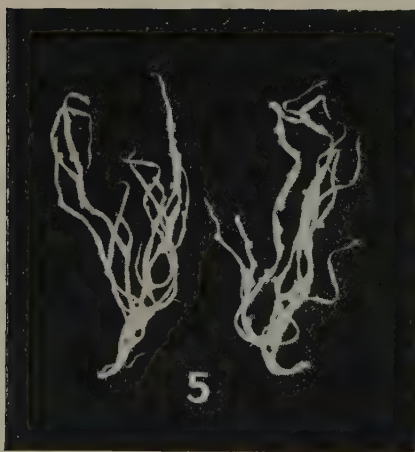
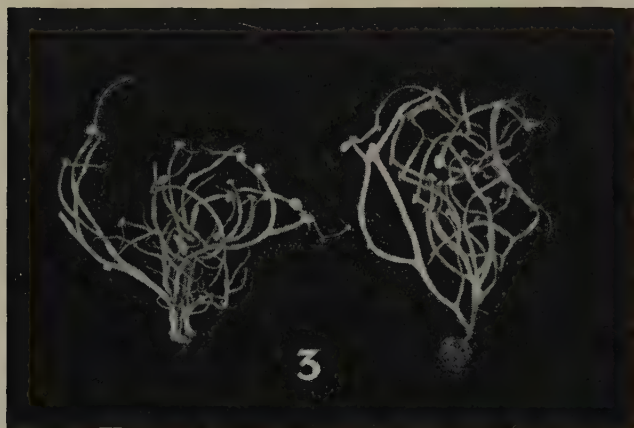
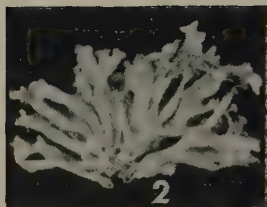
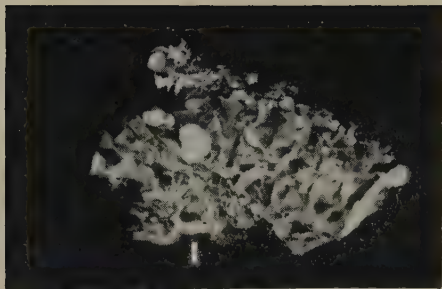
Aan bome, Knysna.

**22. Ramalina lanceolata** Nyl. **Illustrasie 12.**

Thallus geelagtig groen, soveel as 8 cm. lank, vingervormig of onreëlmstig gelob van naby die voet en hierdie lobbe ook weer gelob, die thallus as geheel is dus baie gelob, sylobbe meestal min of meer parallel met dié waarvan hul ontstaan, 1—3 (—5) mm. breed, in die lengte geaard, esorediös. Apothecia volop, sydelings sowel as langs die rande, 1—1.5 mm. diam., ondervlakte glad. Spore reguit of gebuig, 11—15 x 3.7—5 (—6) $\mu$ .

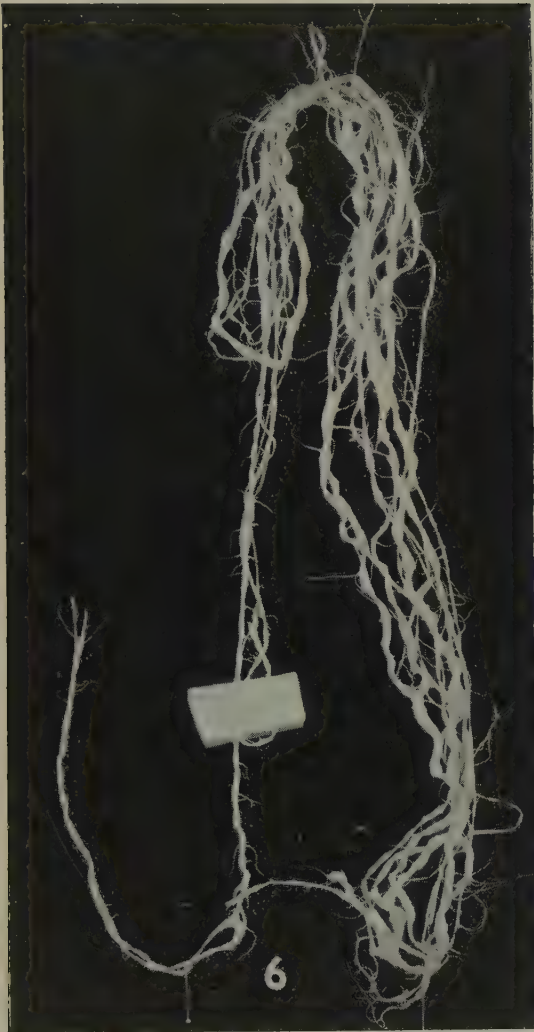
Aan bome: Eikebome by Klapmuts, dist. Paarl; ook versamel deur Drège, Breutel en Wilms.

Verskil van tipiese *R. yemensis* in die meer gelobde thallus, en die lynvormige lobbe wat min of meer parallel is met dié waarvan hul ontstaan.



1. *Ramalina pusilla*.
3. *Ramalina gracilis*.
5. *Ramalina complanata*.

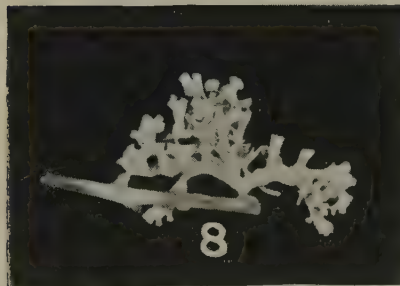
2. *Ramalina geniculata*.
4. *Ramalina farinacea*.



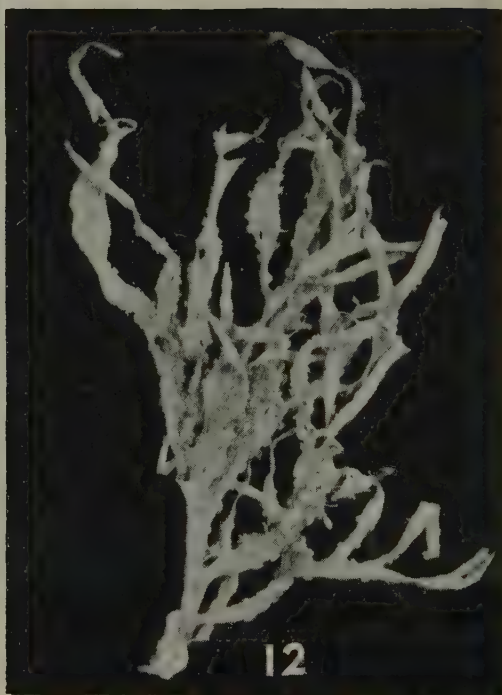
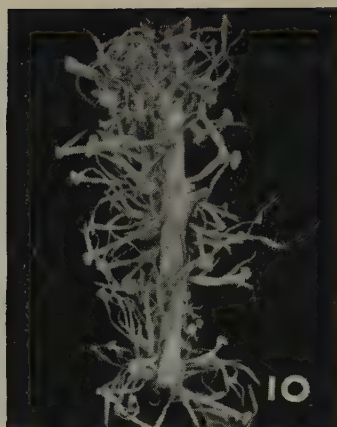
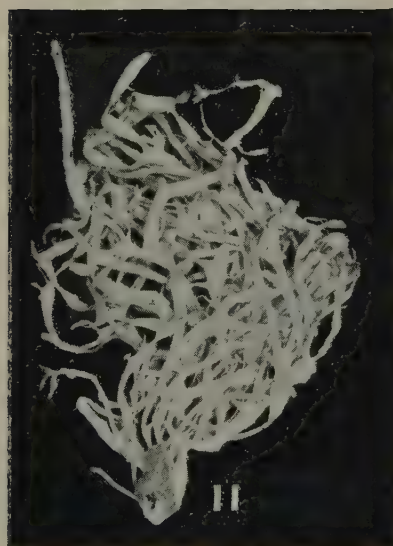
6. *Ramalina usnea* var. *contorta*.



7. *Ramalina fastigiata*.



8. *Ramalina calicaris*.



9. *Ramalina yemensis*.

11. *Ramalina yemensis* var. *membranacea*.

10. *Ramalina yemensis* var. *sublinearis*.

12. *Ramalina lanceolata*.







The Distribution and Prevalence  
of Physiologic Forms of *Puccinia Graminis*  
*Tritici* in the Union of South Africa,  
1930—1934

BY

LEN VERWOERD, D.Sc.Agric. (Stell.)





# The Distribution and Prevalence of Physiologic Forms of *Puccinia Graminis* *Tritici* in the Union of South Africa, 1930—1934

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In a previous contribution<sup>1)</sup> the occurrence of several physiologic forms of *Puccinia graminis tritici* which had been found to occur up to 1929 were recorded. Since the publication of this paper the black stemrust situation has received more particular attention and several phases of the problem have been more closely investigated.

In this contribution the author presents the results of a comprehensive physiologic form survey, which was conducted during the period 1930—1934 in order to determine the prevalence, seasonal occurrence and geographic distribution of physiologic forms of *Puccinia graminis tritici*; such data being of primary importance to the development of rust resistant varieties in South Africa.

During the period 1930—1934 a large number of uredinial collections of representative distribution were obtained from a very large number of localities situated in those sections of the country, where the growing of cereals is of major or minor importance.

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1) Verwoerd, Len.—Die fisiologiese vorms van *Puccinia graminis* (Pers., wat in Suid-Afrika voorkom. S.A. Jnl. of Sc. 28: 274-279, 1931.

The methods employed in the determination of physiologic forms were those generally used in cereal rust research.<sup>2)</sup>

In the present survey no new physiologic forms were found. Of the eight forms thus far known to occur in South Africa, four viz. 13, 29, 98 and 100 have not been found again. Form 99, which had once been found on a grass host (*Dactylis glomerata*) has now been isolated on three different occasions from wheat and once from an unrecorded grass host: Italian rye grass (*Lolium italicum*). Form 21 was collected on one occasion in the Cape Province in 1930 and once again in 1932. From the tables I—IV it will be noted that form 34 is widely distributed in South Africa and has been the prevailing form each year during the period 1930—1934, occurring 95.9% of the total collections determined during the period. In only a very few cases was this form found to be mixed with other forms. Form 38, the second most frequently occurring form, which though known since 1922 appears to be rare, having only been isolated on 33 occasions and which represents an occurrence of 3.4% for the survey period.

The geographic distribution and seasonal prevalence of physiologic forms of *Puccinia graminis tritici* during the period 1930—1934 is indicated in Tables I, II and III.

The result of this physiologic form survey of *Puccinia graminis tritici* is most encouraging, especially to the plant breeder and appears to indicate that the South African stemrust problem is, for the present, of a much less complicated nature than that of most other cereal growing countries.

The fact that a single physiologic form has been predominant each year and to the extent of 95.9% over a period of five crop seasons very much simplifies the development of resistant varieties in spite of the fact that of 400 varieties of wheat tested only a few non-commercial wheats have shown resistance to this virulent form.

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<sup>2)</sup> Verwoerd, Len.—A Review of the black stemrust (*Puccinia graminis* Pers.) situation with special reference to the experimental methods applied in Rust Research in the United States of America and Canada and the nature of the problem in South Africa. Bull. 21, 1935, S-E College of Agriculture, Univ. of Stellenbosch.



Just how long this position will last will remain to be established by continued annual form surveys. Although the physiologic form survey has been very comprehensive as far as the major and minor wheat sections of the Cape Province are concerned, more collections are desirable from the Orange Free State, Transvaal and Natal Provinces especially as regards the occurrence of forms 38 and 99. These studies become all the more important now that large acreages are sown to wheat in the Transvaal and Orange Free State, the success of which may be menaced through the presence of physiologic forms of rust whose distribution is only partially known.

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The author wishes to record his indebtedness to all those who forwarded rust material and desires to make special mention of the assistance rendered in this respect by Messrs. A. G. S. du Toit, Ixopo, Natal; J. D. Heyns, Pietersburg, Tvl.; N. L. Smit, Vredefort, O.F.S.; R. du Toit, Humansdorp, C.P.; A. Marais, Elliot, C.P.; O. A. Langenegger, Kingwilliamstown, C.P.; E. Rood, Clanwilliam, C.P., and F. Bergh, late of George, C.P., Extension Officers of the Union Departement of Agriculture.

TABLE I.

*Geographic distribution and prevalence of physiologic forms of Puccinia graminis tritici in the Union of South Africa, 1930-1934*

Province.	District.	1930.		1931.		1932.		1933.		1934.	
		No. Coll.	Phys. form and the number of occasions isolated.	No. Coll.	Phys. form and the number of occasions isolated.	No. Coll.	Phys. form and the number of occasions isolated.	No. Coll.	Phys. form and the number of occasions isolated.	No. Coll.	Phys. form and the number of occasions isolated.
Cape of Good Hope.	Barkly East	..	..	..	..	..	..	..	..	..	..
	Bredasdorp	16	34 (14); 38 (2)	20	34 (20)	2	34 (2)	2	34 (2)	3	34 (3)
	Caledon	15	34 (15)	20	34 (40)	10	34 (10)	2	34 (2)	7	34 (7)
	Calvinia	6	34 (6)	5	34 (5)	15	34 (15)	3	34 (3)	2	34 (2)
	Cape	15	34 (15)	5	34 (20)	15	34 (15)	4	34 (4)	4	34 (4)
	Ceres	4	34 (4)	5	34 (5)	4	34 (3); 21 (1)	1	34 (1)	2	34 (2)
	Clanwilliam	4	34 (4)	6	34 (6)	2	34 (2)	..	..	2	34 (2)
	Elliot	..	..	15	34 (15)	2	34 (2)	..	..	..	..
	George	6	34 (5); 21 (1)	6	34 (6)	4	34 (4)	4	34 (4)	..	..
	Hopefield	10	34 (10)	10	34 (10)	8	34 (8)	2	34 (2)	2	34 (2)
	Humansdorp	1	34 (1)	6	34 (6)	5	34 (5)	..	..	..	..
	Kingwilliamstown	..	..	6	34 (6)	3	34 (3)	..	..	..	..
	Knysna	3	34 (3)	4	34 (4)	2	34 (2)	..	..	..	..
	Ladismith	4	34 (4)	8	34 (8)	6	34 (6)	..	..	..	..
	Laingsburg	..	..	2	34 (2)	1	34 (1)	..	..	..	..
	Maclear	..	..	20	34 (15); 38 (5)	5	34 (4); 38 (1)	..	..	..	..
	Matatiele	..	..	1	34 (1)	1	34 (1)	..	..	6	34 (6)
	Malmesbury	21	34 (21)	45	34 (45)	20	34 (20)	10	34 (10)	..	..
	Middelburg	..	..	8	34 (6); 38 (2)	2	34 (2)	..	..	..	..
	Molteno	..	..	6	34 (5); 38 (1)	1	34 (1)	..	..	..	..
	Mount Currie	..	..	2	34 (1); 99 (1)	4	34 (4)	..	..	..	..
	Montagu	..	..	2	34 (2)	2	34 (2)	..	..	..	..
	Mossel Bay	2	34 (2)	10	34 (10)	2	34 (2)	1	34 (1)	..	..
	Outeniqua	3	34 (3)	5	34 (5)	7	34 (7)	3	34 (3)	2	34 (2)
	Paarl	8	34 (8)	10	34 (10)	9	34 (9)	3	34 (3)	3	34 (3)
	Piquetberg	4	34 (4)	8	34 (8)	15	34 (15)	4	34 (4)	4	34 (4)
	Riversdale	8	34 (8)	22	34 (22)	18	34 (18)	..	..	3	34 (3)
	Robertson	3	34 (3)	4	34 (4)	6	34 (6)	..	..	..	..
	Stellenbosch	15	34 (15)	32	34 (32)	29	34 (29)	5	34 (5)	3	34 (3)
	Sterkstroom	..	..	2	34 (2)	3	34 (3)	..	..	..	..
	Sutherland	..	..	6	34 (6)	2	34 (2)	..	..	..	..
	Swellendam	8	34 (8)	20	34 (20)	11	34 (11)	3	34 (3)	3	34 (3)
	Tubaghen	2	34 (2)	4	34 (4)	1	34 (1)	1	34 (1)	..	..
	Uniondale	5	34 (5); 38 (2)	2	34 (2)	1	34 (1)	..	..	3	34 (3)
	Wodehouse	..	..	2	34 (2)	..	..	..	..	..	..
	Worcester	..	..	6	34 (6)	10	34 (10)	2	34 (2)	..	..
Total		160	21 (1); 34 (155); 38 (4)	377	34 (368); 38 (8); 99 (1)	229	21 (1); 34 (227); 38 (1)	49	34 (49)	52	34 (52)

TABLE I (continued).

Province.	District.	1930.		1931.		1932.		1933.		1934.	
		No. of Coll.	Phys. form and the number of occasions isolated.	No. of Coll.	Phys. form and the number of occasions isolated.	No. of Coll.	Phys. form and the number of occasions isolated.	No. of Coll.	Phys. form and the number of occasions isolated.	No. of Coll.	Phys. form and the number of occasions isolated.
Orange Free State.	Bloemfontein (Glen)	—	—	6	34 (4); 38 (2)	3	34 (3)	—	—	2	34 (2)
	Ficksburg ..	—	—	5	34 (4); 38 (1)	6	34 (6)	—	—	5	34 (5)
	Ladybrand ..	—	—	5	34 (4); 38 (1)	2	34 (1); 38 (1)	—	—	3	34 (3)
	Vredfort ..	—	—	1	34 (1); 38 (1)	2	34 (2)	—	—	2	34 (2)
	Winburg ..	—	—	5	34 (5)	1	34 (1)	—	—	4	34 (4)
	Total ..	—	—	22	34 (17); 38 (5)	14	34 (13); 38 (1)	—	—	16	34 (16)
Transvaal	Lydenburg ..	2	34 (2)	6	34 (5); 38 (1)	10	34 (8); 38 (2)	3	34 (3)	2	34 (2)
	Pietersburg ..	—	—	2	34 (1); 38 (1)	1	34 (1)	—	—	—	—
	Potchefstroom ..	3	34 (2); 38 (1)	5	34 (3); 38 (2)	8	34 (5); 38 (3)	—	—	2	34 (2)
	Springs ..	—	—	1	34 (1); 38 (1)	—	—	—	—	—	—
	Total ..	5	34 (4); 38 (1)	14	34 (9); 38 (5)	19	34 (14); 38 (5)	3	34 (3)	4	34 (4)
Natal.	Umzimkulu ..	—	—	3	34 (1); 38 (1); 39 (1)	1	38 (1)	—	—	—	—
	Ixopo ..	—	—	4	34 (1); 38 (1); 39 (2)	2	34 (2)	—	—	—	—
	Total ..	—	—	7	34 (2); 38 (2); 39 (3)	3	34 (2); 38 (1)	—	—	—	—
	Grand Total	165	21 (1); 34 (159); 38 (5)	420	34 (396); 38 (20); 39 (4)	265	21 (1); 34 (25); 38 (8)	52	34 (52)	72	34 (72)

TABLE 2.

*Distribution by Provinces of the physiologic forms of Puccinia graminis tritici in South Africa, 1930-1934.*

Province.	1930.			1931.			1932.			1933.	1934.
	21	34	38	34	38	99	21	34	38	34	34
Cape of Good Hope ..	1	155	4	368	8	1	1	227	1	49	52
Orange Free State ..	—	—	—	17	5	—	—	13	1	—	10
Transvaal .. ..	—	4	1	9	5	—	—	14	5	3	7
Natal .. ..	—	—	—	2	2	3	—	2	1	—	3
Total .. ..	1	159	5	396	20	4	1	256	8	52	72

TABLE 3.

*Annual occurrence of physiologic forms of Puccinia graminis tritici in the Union of South Africa from 1930-1934 and recording the number of occasions each form was collected annually.*

Physiologic form.	Number of occasions the form was isolated.				
	1930.	1931.	1932.	1933.	1934.
21	1	—	1	—	—
34	159	396	256	52	72
38	5	20	8	—	—
99	—	4	—	—	—
Total Nos. of forms ..	4	3	3	1	1
Total Nos. of collections made during the year ..	165	420	265	52	72

TABLE 4.

*The relation between the total number of collections of Puccinia graminis tritici made in the Union of South Africa each year and the number of physiologic forms isolated.*

Year.	No. of collections.	No. of forms.	Prevalence.			
			Physiologic form.			
			21	34	38	99
1930	165	4	1	159	5	—
1931	420	3	—	396	20	4
1932	265	3	1	256	8	—
1933	52	1	—	52	—	—
1934	72	1	—	72	—	—
1930—1934	974	4	2	935	33	4















Korsmosse van die Unie van Suid-Afrika.  
V. Familie Collemaceae.

DEUR

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NASIONALE PERS, BEPERK, Kaapstad  
1935.



# Korsmosse van die Unie van Suid-Afrika.

## V. Familie Collemaceae.

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### *Eienskappe van die Familie.*

Thalli tipies jellieagtig as hul nat is, meestal blaaragtig, soms korsagtig, gelob, met of sonder 'n skors, rhizines aan- of afwesig. Die wiercelle behoort tot die geslag *Noctoc* en is meestal min of meer eweredig tussen die swamdrade van die thalli versprei, d.w.s. die thalli is meestal homoiomeries. Apothecia tipies wyd ope, met 'n thallusrand by die Suid-Afrikaanse geslagte. Askospore meestal 8 in 'n askus, eencellig, parallel twee tot meercellig, of muurvormig gedeeld (d.w.s. in die lengte sowel as dwars).

Groei meestal aan boomstamme, maar word ook soms aan klippe aangetref.

### *Sleutel tot die Suid-Afrikaanse Geslagte.*

Askospore eencellig ... .. 1. **Physma.**

Askospore of parallel 2-meercellig, of muurvormig gedeeld.

Thallus sonder 'n skors:

Askospore of parallel 2-meercellig,  
of muurvormig gedeeld ... .. 2. **Collema.**

Thallus met 'n skors of aan beide die onder- en die oppervlakte, of alleenlik aan die oppervlakte:

Askospore muurvormig gedeeld ... 3. **Leptogium.**

*Beskrywings van die Soorte van Genoemde Geslagte.*

**Physma** Mass.

Askospore 15-20x8-12  $\mu$  ... .. 1. **Ph. byrsinum.**

Askospore 18.5-35x11-15  $\mu$  ... .. 2. **Ph. callicarpum.**

1. **Physma byrsinum** (Ach) Müll. Arg.

Thallus lood- of askleurig, 5 cm. diam. of groter, gelob; lobbe stralend, getand, jong lobbe mooi netvormig geaard, ietwat gerimpeld; ondervlakte met rhizines, of viltig.

Apothecia 2-3.5 mm. diam., rooi, plat of ietwat konkaaf; rand geswel, gerimpeld. Spore eencellig, 15-20x8-12  $\mu$ , eier-vormig tot ellipties; muur ongeveer 1.5  $\mu$  dik.

Groei aan boomstamme en op mosse: In Natal deur Armstrong-MacKenzie. Ook bekend van Sierra Leone, Australië, Amerika en Asië.

2. **Physma callicarpum** Hue.

**Illustrasie 1.**

Thallus lood- of askeurig by gedroogde exemplare, vaalbruin as hy nat is, soveel as 5 cm. diam.; lobbe gerimpeld en rande ingesny. Apothecia 1-2(-3) mm. diam.; ligbruin tot rooibruin, plat tot konkaaf; rand verhewe bo die skyf, ligvaalbruin by gedroogde exemplare, vaalbruin as hy nat is, gerimpeld. Spore ellipties, 18.5-35x11-15  $\mu$ .

Aan boomstamme: Plettenbergbaai, Kaapland.

*Verskil van Ph. byrsinum in die groter spore.*

**Collema** (Wigg.) Zahlbr.

*Sleutel tot die Soorte.*

**Op die grond:**

Apothecia min of meer in die thallus

ingebed ... .. 1. **C. tenax.**

Aan bome :

Askospore parallel-meercellig :

Askospore meer as  $50\mu$  lank ; apothecia volop en dig op mekaar ... 2 **C. aggregata.**

Askospore minder as  $50\mu$  lank :

Askospore baie dun, soveel as  $3\mu$  dik ... 3. **C. redundans.**

Askospore mee as  $3\mu$  dik :

Apothecia volop, baie dig op mekaar ; askospore tot  $6.5\mu$  dik ... 4. **C. nigrescens.**

Apothecia nie so dig op mekaar as hierbo nie ; askospore tot  $9\mu$  dik ... 5. **C. thysaneum.**

# 1. **Collema tenax** (Sw.) Ach.

Thallus meestal min of meer cirkelvormig, grootblarig, stewig vas aan substraat, donkergroen, geelgroen, of blougroen, gelob; lobbe dakpanvormig. Apothecia 0.5-2 mm., meestal min of meer in die thalluslobbe ingebed; skyf plat of konkaaf, rooibruin; rand gaaf of getand. Spore eiovormig-ellipties, 4-cellig, word ietwat muurvormig,  $12-25 \times 8-12\mu$ .

Op die grond: Tafelberg, Kaapstad (Eaton).

Ook bekend van Europa, die Verenigde State, en ander wêrelddele.

## 2. **Collema aggregatum** (Ach.) Röbling. Illustrasie 2.

Thallus ietwat stewig, met onreëlmatige voue of rimpels, gelob; lobbe getand, of meestal korrelagtig en kroeserig langs die rande. Apothecia 3-7 mm. diam., dig op mekaar, plat maar word konvex, rooiagtig tot donkerrooi; rand gaaf tot korrelagtig. Spore spindelvormig-sekelvormig,  $55-85 \times 5.5-7\mu$ , meercellig.

Aan bome: Salisbury, Rhodesië (F. Eyles 4211).

Ook bekend van Engeland en ander wêrelddele.

Ná aan *C. nigrescens* maar daarvan te onderskei deur die langer spore.



### 3. *Collema redundans* Nyl.

Thallus olyfkleurig, word swart, min of meer cirkelvormig, klein, gerimpeld en korrelagtig. Apothecia donkerbruin tot swart, 0.4-0.5 mm. diam., konvex. Spore sekelvormig, dun,  $15-21 \times 3 \mu$ .

Aan boomstamme: Natal (Armstrong-MacKenzie).

Skygbaar slegs bekend van die oorspronklike versameling.

*Herkenbaar aan die dun spore.*

### 4. *Collema nigrescens* (Huds.) D.C.

#### Illustrasie 3.

Thallus dun, olyfgroen van kleur, word swart, uitgestrek, min of meer cirkelvormig, gelob, met stralende voue of rimpels, oppervlakte soms korrelagtig met isidia; rand gaaf tot ietwat korrelagtig. Apothecia volop, baie dig op mekaar, 0.5-1.25 mm. plat tot konvex, rooi; rand dun, gaaf. Spore spindelvormig-sekelvormig,  $37-42 \times 5-6.5 \mu$ , meercellig.

Aan boomstamme: Salisbury, Rhodesië (F. Eyles 650); Zoeloeland (R.H.P. Harris).

Ook bekend van die Verenigde State, Engeland, Australië, Europa, en ander wêrelddele.

*Ná aan C. aggregatum waarvan dit onderskei word deur die kleiner spore.*

### 5. *Collema thysaneum* Ach.

Thallus swart-olyfkleurig, of as-olyfkleurig; lobbe groot, dun, min of meer getand. Rand van apothecia gaaf. Spore cilindries, ietwat sekelvormig,  $23-46 \times 5-9 \mu$ .

Aan bome: Kaap die Goeie Hoop (Breutel).

Ook bekend van Europa, Nu-Seeland, Java.

**Leptogium** S. Gray.

Apothecia langs rande van lobbe ... .. 1. **L. marginellum.**

Apothecia aan oppervlakte:

Rhizines duidelijk aan ondervlakte:

Rhizines lank, gebundeld; askospore

16-24 x 8-10  $\mu$  ... .. 2. **L. Hildebrandii.**

Rhizines kort, dig, wit; askospore

22-32 x 12-17  $\mu$  ... .. 3. **L. Menziesii.**

Rhizines nie duidelik nie, feitlik net sigbaar onder die  
21. mikroskoop:

Middellaag van lobbe òf nie jellieagtig nie, òf maar  
swak jellieagtig:

Askospore 14.8-22 x 6-12  $\mu$  ... .. 4. **L. moluccanum.**

Askospore 24-38 x 10-12  $\mu$ :

Apothecia ingesink in spitse,  
vingervormig uitgeswelde  
thallus-dele ... .. 5. **L. bullatum.**

Middellaag van lobbe sterk jellieagtig:

Thallusrand van apothecia gerimpeld, met skub-  
betjies of korrelagtige isidia beset:

Askospore 50  $\mu$  of meer  
lank; rand van apothecia  
gerimpeld ... .. 6. **L. adpressum.**

Askospore minder as 50  $\mu$  lank:

Thallusrand van apothecia  
gerimpeld en met skub-  
betjies beset ... .. 7. **L. phyllocarpon.**

Thallusrand van apothecia  
gerimpeld en met kor-  
relagtige isidia beset ...

8. **L. chloromelum.**

Thallusrand van apothecia nòg met skubbetjies nòg met isidia beset :

Askospore baie smal

(4.5  $\mu$  dik) ... .. 9. **L. chloromeloides.**

Askospore dikker :

Askospore 18-27  $\mu$  lank 10. **L. tremelloides.**

Askospore 26-36  $\mu$  lank 11. **L. africanum.**

### 1. **Leptogium marginellum** (Sw.) S. Gray.

Thallus dun, lood-askleurig, word byna swart, onreëlmagig gelob; lobbe 1-15 mm. breed, dig op mekaar, imbrikaat, opper- en ondervlakte gerimpeld, isidia afwesig. Apothecia langs die rande van die thalluslobbe, of selde aan die oppervlakte, 0.3-0.7 mm. diam; rand gaaf, bleek. Spore sekelvormig, muurvormig gedeeld, 20-26(-30) x 7-10  $\mu$ .

Aan bome.

Dit word vermeld dat Gueinzus hierdie soort aan die Kaap die Goeie Hoop versamel het.

Ook bekend van Brasilië, Australië, Java, en ander wêrelddele.

### 2. **Leptogium Hildebrandii** (Garov.) Nyl.

Thallus vlies-leeragtig, sirkelvormig, bruin-loodkleurig tot groenagtig bruin, gelob; lobbe golwend, gerimpeld, ondervlakte met lang gebundelde rhizines. Apothecia bruin tot rooiagtig, klein, skyf plat tot ietwat konvex. Spore ellipties, 16-24 x 8-10  $\mu$

Aan bome.

Stizenberger vermeld dat hierdie soort in Natal deur Rehmann en deur Armstrong-Mackenzie versamel is, en in die Transvaal deur Wilms.

Ook bekend van Amerika, Europa en Engeland.

### 3. **Leptogium Menziesii** Mont.

Thallus loodkleurig, word donkerder, 5-8 cm. diam., gelob of ingesny, golwend, ietwat gerimpeld; ondervlakte met digte, wit rhizines wat nie lank is nie. Apothecia rooi tot donker, plat, soveel as 3 mm. diam. Spore ellipties, meercellig (tot muurvormig gedeeld),  $22-23 \times 12-17 \mu$ .

Aan hout en tussen mos.

Dit word vermeld dat Drège hierdie soort in Kaapland versamel het; Gueinzus in Natal, en Bauer in Kafferland.

Ook bekend van China, Chili en Indië.

#### f. **fuliginosa** Müll. Arg.

Oppervlakte van thali in dele met donker isidia.

Spore onbekend.

Aan die Kaap die Goeie Hoop deur MacOwan.

### 4. **Leptogium Moluccanum** (Pers.) Wain.

Thallus loodkleurig tot blouagtig loodkleurig, onreëlmatig gelob; lobbe langwerpig, imbrikaat, middellaag nie duidelik jellieagtig nie. Apothecia 1.7-2 mm. diam.; skyf rooi tot rooi-bruin; rand gaaf, bleek tot askleurig. Spore  $14.8-22 \times 6-12 \mu$ .

*Verskil van L. tremelloides feitlik net in die dunner lobbe waarvan die middellaag nie jellieagtig is nie.*

#### var. **simplicata** Wain.

Aan boomstam: Stellabos, Durban, Natal.

### 5. **Leptogium bullatum** (Sw.) Mont.

Thallus dun, onreëlmatig ingesny-gelob, loodkleurig tot groenagtig; lobbe golwend, gerimpeld, middellaag swak jellieagtig. Apothecia  $1.5-3.5 \mu$ , ingesink in spitse, vingervormig uitgeswelde thallusdele, breek later deur, of teen genoemde uit-swelsels gedruk; skyf rooi tot rooi-bruin; rand gaaf. Spore  $24-38 \times 10-12 \mu$ , muurvormig-meercellig.

Tussen mos aan boomstamme en aan klippe in tropiese en subtropiese wêrelddele.

*Hierdie soort is maklik van ander te onderskei deur die uitgeswelde thallusrand van die apothecia.*

**f. dactylinoideum** Nyl.

Uitgeswelde thallusdele waarin die apothecia ontwikkel, is lank uitgerek, en lyk op podetia.

Volgens Stirton is hierdie variëteit in Suid-Afrika gevind.

**6. Leptogium adpressum** Nyl.

Thallus dig aan substraat, 25-60 mm. diam., loodkleurig tot groenagtig of olyfkleurig, gelob; lobbe gerimpeld, met golwende rande. Apothecia rooi, 2 mm. diam., plat; rand gerimpeld. Spore sekelvormig, 7- tot 10-cellig,  $50-60(-86) \times (5-7)-8 \mu$ .

Aan bome.

Volgens Stirton is hierdie soort in Kaapland versamel.

Ook bekend van Mexiko.

*Ná aan L. chloromelum, en die vernaamste verskil is die groter, sekelvormige, 7- tot 10-cellige spore.*

**7. Leptogium phyllocarpon** (Pers.) Mont.

Thallus dik, lood-askleurig tot asbruin, of selde blouagtig, sonder isidia, 4-10 cm. diam., onreëlmstig gelob; lobbe 1-5 mm. breed, rand golwend of ietwat gekerf, opper- en ondervlakte onreëlmstig gerimpeld. Apothecia rooi, 1.5-8 mm., plat tot konkaaf; rand gerimpeld, beset met klein thallusskubbe. Spore ellipties, muurvormig gedeeld,  $22-34 \times 12-15 \mu$ .

Aan bome.

Aangeteken van die Kaap die Goeie Hoop deur Nylander en deur Stirton.

Ook bekend van Madagaskar, Amerika en Asië.

*Die sterk gerimpelde lobbe, en die klein thallusskubbe aan die rand van die apothecia onderskei hierdie soort van die ander.*

var. **corralloideum** (Mey. & Fw.) Hue (= var. **isidiosum** Nyl.).

Thallus groenagtig askleurig, met gerimpelde of skurfagtige isidia.

Volgens Stirton kom hierdie variëteit in Kaapland voor.

var. **daedaleum** Nyl.

Thallus groenagtig loodkleurig of bruinagtig loodkleurig, golwend, gerimpeld. Apothecia rooi, 5 mm. diam., rand dik. Spore 26-36 x 13-17  $\mu$ .

Versamel deur Rehmann in die Transvaal, en Stirton vermeld dit van Kaapland; deur die skrywer by Knysna.

var. **macrocarpum** Nyl.

Thallus loodkleurig. Apothecia rooi, groot, 5-9 mm., rand met thallusskubbe beset.

Vermeld van Kaapland deur Stirton.

## 8. **Leptogium chloromelum** (Ach.) Nyl.

Thallus dun, onreëlmstig tot min of meer sirkelvormig, of ietwat verspreid, loodkleurig tot groenagtig of olyfkleurig, gerimpeld, soms dig met korrelagtige isidia beset, gelob; lobbe min of meer imbrikaat en met golwende of ingeskeurde rande. Apothecia rooi of rooibruin, konkaaf tot plat; thallusrand dik, gerimpeld, of met korrelagtige isidia beset. Spore ellipties, muurvormig-meercellig, 20-37 x 10-17  $\mu$ .

Tussen mos aan 'n boom aan die rand van 'n bos, Umtali, Rhodesië (F. Eyles 4847).

var. **crassius** Nyl.

Verskil van die soort daarin dat die thallus dikker is. Spore 34-40 x 12-15  $\mu$ .

Aan boomstamme, Natal (Armstrong-MacKenzie).



### 9. **Leptogium chloromeloides** Nyl.

Lyk op *L. chloromelum* maar spore baie smaller ( $4.5\ \mu$  volgens Nylander).

Versamel in Natal deur Armstrong-MacKenzie.

### 10. **Leptogium tremelloides** (L.f.) S. F. Gray.      **Illustrasie 4.**

Thallus meestal blouagtig loodkleurig, soms dof-olyfgroen of askleurig, onreëlmstig gelob; lobbe dun, langwerpig, imbri-kaat, rand gaaf tot ietwat getand. Apothecia 1-2(-3) mm. diam.; skyf rooi tot rooibruin, plat of konkaaf; thallusrand gaaf, bleek tot askleurig. Spore eivormig tot breed-sekelvormig, muur-vormig gedeeld,  $18-27 \times 8-12\ \mu$ .

Aan bome: Empangeni, Zoeloeland (R. H. Harris); Not-tingham Road, Natal; aan *Chaetachme aristata*, Winkelspruit, Natal; in die Transvaal deur Wilms; verder in Kaapland deur Eaton, MacOwan, en Zeyher.

Ook bekend van die Britse Eilande; en van Asië, Europa, Australië, en Amerika.

#### f. **azureum** (Sw.) Nyl.

'n Kleurvorm van die soort. Thallus hemelsblou van kleur Aan klippe, Paradys, Stellenbosch (B. Slabbert); aan klip, Umtali, Rhodesië (F. Eyles, 4294); boomstam, Knysna.

### 11. **Leptogium africanum** A. Zahlbr.

Thallus uitgestrek, soveel as 10.5 cm. diam., loodkleurig tot olyfgroen, ingesny-gelob; lobbe dig op mekaar, opstygend, golwend; oppervlakte gerimpeld, isidia en soredia afwesig; ondervlakte kaal; middellaag jellieagtig. Apothecia soveel as 5 mm. diam.; skyf rooibruin; vrugrand of excipulum betreklik goed ontwikkel en grootcellig onder die hymenium, maar minder goed ontwikkel en kleincellig langs die sye, terwyl dit hoër op feitlik in swamdrade verloop; thallusrand eers dik en gaaf, later dun en gekarteld. Spore  $26-36 \times 10-12\ \mu$ , muurvormig gedeeld.

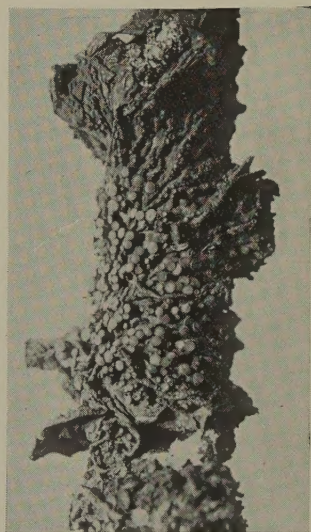
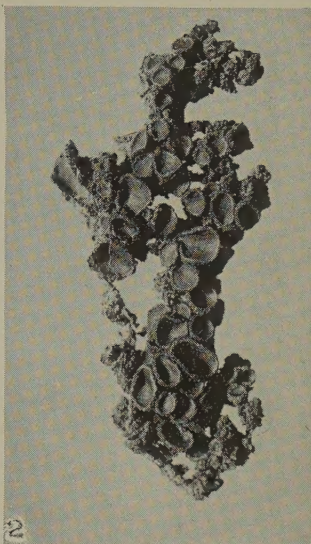
In die Winterhoeksberge, Uitenhage, deur Zeyher.

Zahlbruckner vermeld dat die geaardheid van die vrugrand of excipulum, feitlik die mees kenmerkende eienskap van hierdie soort is. Daardeur onderskei hy hom van *L. fallax* var. *sublaeve* Müll. Arg. wat baie op hom lyk.

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Die illustrasies is van foto's goedgunstiglik vir my geneem deur dr. R. I. Nel.





4

1. *Physma callicarpum*.
4. *Leptogium tremelloides*.

3

2. *Collema aggregatum*.
3. *Collema nigrescens*.









